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# ORK PLAN

FOR WATERSHED PROTECTION AND FLOOD PREVENTION

# CROMLINE CREEK WATERSHED

## ORANGE COUNTY, NEW YORK


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ADDENDUM

CROMLINE CREEK WATERSHED WORK PLAN

Orange County, New York

## INTRODUCTION

This addendum was developed in accordance with phase-in procedures agreed to between the Water Resources Council and the USDA, Soil Conservation Service for Level C plans for which field studies, analyses, and evaluations were completed as of October 25, 1973, and which have been formulated in accordance with Senate Document 97 as supplemented and amended, and which are to be transmitted to the OMB between December 31, 1973 and December 31, 1974

## DISCOUNT RATE COMPARISON

This plan was formulated before October 25, 1973 following the general guidance outlined in Senate Document 97. However, in evaluations an interest rate of 6 7/8 percent as outlined in the Principles and Standards was used. Installation costs are based upon prices being experienced in 1974. Benefits and operation and maintenance costs are based upon adjusted normalized prices. Average annual costs are $25,400 and average annual benefits are $42,500 and the benefit cost ratio is 1.7:1.0.

Using an interest rate of 5 7/8 percent, 1974 prices for installation costs and adjusted normalized prices for benefits and operation and maintenance costs, average annual costs are $23,600 average annual benefits are $42,500, and the B:C ratio would be 1.8 to 1.0.

MAR 10 1975

Areas similar to the mucklands of this watershed have yielded archeological and paleontological material which included remains of mastodons, caribou and other post glacial animals.

## OBJECTIVES

Objectives of the sponsors are to preserve areas of natural beauty; maintain or enhance the quality of water, land and air resources; improve and maintain biological resources and ecological systems; and to prevent destruction or loss of geological, archeological and historical resources.

## COORDINATION

The sponsors, interested local groups, state agencies, Environmental Protection Agency, U.S. Fish and Wildlife Service have been involved in planning efforts regarding environmental aspects of the project.

## FORMULATION

The environmental quality plan includes conservation land treatment and the regulation of land and water resource uses.

The land treatment phase is nearly identical with the land treatment phase of the selected plan. Treatment of 400 acres of cropped muckland is omitted. Briefly, the land treatment phase includes adequate treatment of 2,920 acres of forest land and about 4,000 acres of land to undergo urban development over the next 10 years. Applicable measures, shown on Table 1, emphasize those to minimize erosion and sediment production and for fish and wildlife protection and improvement.

TABLE 1 - LAND TREATMENT INSTALLATION

| Land Treatment Measures | Unit | Amount to be Applied |
|---|---|---|
| Forest Land | | |
| Forest Management | Ac. | 2,920 |
| Urban-Environmental Forestry | Ac. | 2,270 |
| Urban Land | | |
| Conservation Plans | No. | 6 |
| Access Road | Ft. | 22,000 |
| Critical Area Planting | Ac. | 18 |
| Debris Basin | No. | 5 |
| Dike | Ft. | 500 |
| Diversion | Ft. | 3,000 |
| Drainage Main or Lateral | Ft. | 1,500 |
| Fencing | Ft. | 4,000 |
| Fishpond Management | No. | 8 |
| Grade Stabilization Structure | No. | 4 |
| Grassed Waterway or Outlet | Ac. | 3 |
| Hedgerow Planting | Ft. | 1,200 |
| Mulching | Ac. | 20 |
| Pond | No. | 4 |
| Wildlife Watering Facility | No. | 5 |
| Land Protected During Development | Ac. | 600 |
| Structure for Water Control | No. | 3 |

Technical assistance will be provided to plan land use changes, install needed conservation measures, manage watershed resources, and maintain conservation measures throughout the watershed. Assistance will be given to planning and zoning boards, community leaders, and land developers in the proper use, treatment, and development of resources in the expanding urban area. General technical assistance will also be provided for environmental education and stimulating landowners to participate in good land management practices.

Regulation of land and water resource uses can be achieved by legislation and implementation of that legislation. Urban type developments should be permitted on those sites best suited to this purpose and only after development of a plan to control erosion and retain or replace certain vegetation. Filling of wetlands should be prohibited and use of flood plain land should be limited to agriculture, recreation and natural areas.

The estimated cost for application of the land treatment phase would be about $298,550. Technical assistance costs for the land treatment phase and for implementation of the land and water use regulations would be about $85,300.

## IMPLEMENTATION

The proposed Environmental Quality Plan could be implemented through P.L. 566 administered by the Soil Conservation Service. Authorities provided through this act could be used to supplement authorities of the county, state and federal agencies.

The land treatment phase could be implemented through the Orange County Soil and Water Conservation District. Technical assistance could be provided by local, state and federal agencies through their going programs in accordance with their authorities and responsibilities. P.L. 566 funds might be used by the Soil Conservation Service and Forest Service to provide accelerated technical assistance. The landowners and operators would finance the cost of installing measures on their land utilizing their usual source of funds with cost sharing assistance available through going conservation programs.

Regulations for land and water use have been established by townships in the watershed area. The several state and federal agencies, through their going authorities, could assist with development of resource information for development of a master plan by the Township Planning Boards. The agencies could also assist by making recommendations for specific development plans for specific areas. Information developed by the Soil Conservation Service concerning flood plains could be used as a starting point for delineation of flood prone areas. P.L. 566 funds required to supplement going program funds might be used to provide accelerated technical assistance furnished by the Soil Conservation Service and the U.S. Forest Service.

## EFFECTS AND IMPACTS

The combined effects of the abbreviated Environmental Quality Plan would be to preserve areas of natural beauty, improve the quality of water, land and air resources, maintain and improve biological resources and ecological systems and avoid disturbances of archeological and paleontological material as compared to conditions that might exist without a plan or with other plans.

Through resource inventory, evaluation, planning and follow up, significant areas of natural beauty could be preserved while developing urban areas. Original vegetation could be preserved, where important, or vegetation introduced as needed for sound and sight barriers, for infiltration and erosion control. Plantings for wildlife food and cover could be interspersed.

Gross erosion on the urbanizing land could thus be reduced from 5,600 tons to 4,500 tons annually. Although gross erosion from other land uses is now close to minimal, it would be reduced even further by installation of the land treatment phase. Annual quantities of sediment delivered to the mouth of the watershed could thus be reduced by installation of the Environmental Quality Plan from 5,200 to 5,000 tons. Sediment concentration at the mouth of the watershed could thus be reduced from 136 to 130 milligrams per liter.

By virtue of reserving flood plain lands for agriculture and less extensive use, it is not likely that archeological or paleontologic remains that might exist in the marsh areas would be seriously disturbed.

Planned urban development is expected to result in less damage to biological resources and ecological systems than would unregulated, unrestricted use. Streams would be free enough of sediments to support adopted organisms without serious harm.

## DISPLAY ACCOUNTS - SELECTED PLAN

A display of the beneficial and adverse effects are given in the following pages for:

National economic development

Environmental quality

Regional development

Social well-being

SELECTED PLAN

NATIONAL ECONOMIC DEVELOPMENT

| Components | Measures of Effects 1/ | Components | Measures of Effects |
|---|---|---|---|
| Beneficial effects: | | Adverse effects: | |
| A. The value to users of increased outputs of goods and services | | A. The value of resources required for a plan | |
| 1. Flood prevention | $25,400 | 1. Channel work | |
| 2. Land treatment | 32,600 | Project construction | $20,150 |
| | | Project administration | 2,250 |
| | | O&M | 3,000 |
| | | 2. Land treatment | |
| | | Project construction | 29,300 |
| | | O&M | 3,300 |
| Total beneficial effects | 58,000 | Total adverse effects | 58,000 |
| | | Net beneficial effects | 0 |

1/ Average annual values based on 25 years @ 6 7/8 percent interest.

SELECTED PLAN

REGIONAL DEVELOPMENT

| Components | Measures of Effects 1/ State of New York | Rest of Nation |
|---|---|---|
| Income: | | |
| Beneficial effects: | | |
| A. The value to users of increased output of goods and services | | |
| 1. Flood prevention | 25,400 | - |
| 2. Land treatment | 32,600 | - |
| B. The value of output to users by region from external economics | | |
| 1. Secondary benefits associated with increased agricultural production (processing and storage) | 17,100 | -17,100 |
| Total beneficial effects | 75,100 | -17,100 |

| Components | Measures of Effects 1/ State of New York | Rest of Nation |
|---|---|---|
| Income: | | |
| Adverse effects: | | |
| A. The value of resources contributed from within the region to achieve the outputs. | | |
| 1. Channel work | | |
| Project construction | 3,800 | 16,350 |
| Project administration | 300 | 1,950 |
| O&M | 3,000 | |
| 2. Land treatment | | |
| Project construction | 29,300 | - |
| O&M | 3,300 | - |
| Total adverse effects | 39,700 | 18,300 |
| Net beneficial effects | 35,400 | -35,400 |

1/ Average annual values based on 25 years @ 6 7/8 percent interest.

SELECTED PLAN

REGIONAL DEVELOPMENT

| Components | Measures of Effects | | Components | Measures of Effects | |
|---|---|---|---|---|---|
| | State of New York | Rest of Nation | | State of New York | Rest of Nation |
| Employment: | | | | | |
| Beneficial effects: | | | | | |
| A. Increase in the number and types of jobs | | | | | |
| 1. Induced employment in storage and processing, of vegetables, activities | 3 man-years of permanent semi-skilled employment | - | | | |
| 2. Employment for project O&M | .5 man-years of permanent semi-skilled employment | - | | | |
| Total beneficial effects | 3.5 man-years of permanent semi-skilled employment | - | | | |

SELECTED PLAN

ENVIRONMENTAL QUALITY

| Components | Measures of Effects |
|---|---|
| Beneficial and adverse effects: | |
| A. Areas of natural beauty | 1. Preservation of natural vegetation on 4,000 acres of land to be urbanized during next 10 years. |
| | 2. A strip, of cropland, about 2.1 miles long and 25 feet wide will become part of channel system. |
| B. Quality considerations of land, water and air | 1. Gross erosion on about 4,000 acres of urbanizing land will be reduced from 28.0 to 22.5 tons per acre annually during construction (3 to 12 months). |
| | 2. Temporary increase in air and noise pollution during construction. |
| | 3. Annual quantities of sediment delivered to watershed mouth will be reduced from 5,200 to 5,000 tons. |
| | 4. Temporary increase in downstream sediment concentrations during construction. |
| | 5. Average sediment concentration at the mouth will be reduced from 136 to 130 milligrams per liter. |
| C. Biological systems and ecological resources | 1. Preserving or minimizing losses of wildlife habitat on about 4,000 acres of urbanizing land. |
| | 2. Enhancement of forest wildlife habitat on about 2,920 acres. |
| | 3. Elimination of about 3 acres of perennial weeds on banks, and cattails and other emergent aquatics in the channel. |
| | 4. Three acres of maintained legumes and grasses will be created and will be usable as nesting cover by songbirds and waterfowl. |
| | 5. Muskrat activity in the channel will be temporarily disturned during construction |
| D. Irreversible and Irretrievable | 1. Committing of 6 acres of cropland to channel use. |

SELECTED PLAN

SOCIAL WELL-BEING

| Components | Measures of Effects |
| --- | --- |
| Beneficial and adverse effects: | |
| A. Real income distribution | 1. Increase the average net income of the 10 muckland farm operators by $2,500 per operator. |

WATERSHED WORK PLAN AGREEMENT

between the

ORANGE COUNTY LEGISLATURE
ORANGE COUNTY SOIL AND WATER CONSERVATION DISTRICT

(hereinafter referred to as the Sponsoring Local Organization)

State of New York

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Cromline Creek Watershed, State of New York, under the authority of the Watershed Protection and Flood Prevention Act (P.L. 566, 83d Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Cromline Creek Watershed, State of New York, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about 10 years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire, with other than P.L. 566 funds, such landrights as will be needed in connection with the works of improvement. (Estimated Cost $44,900).

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894), and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

| | Sponsoring Local Organization (percent) | Service (percent) | Estimated Relocation Payment Costs (dollars) |
|---|---|---|---|
| Relocation Payments | 57.1 | 42.9 | 0 1/ |

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

| Works of Improvement | Sponsoring Local Organization (percent) | Service (percent) | Estimated Construction Cost (dollars) |
|---|---|---|---|
| All Structural Measures | 0 | 100 | 166,000 |

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

| Works of Improvement | Sponsoring Local Organization (percent) | Service (percent) | Estimated Engineering Costs (dollars) |
|---|---|---|---|
| All Structural Measures | 0 | 100 | 26,500 |

6. The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which it incurs, estimated to be $3,300 and $23,200 respectively.

7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

14. No member of or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving federal financial assistance.

16. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Orange County Soil and Water Conservation District
Local Organization
453 East Route 211
Middletown, N. Y. 10940
Address Zip Code

By /s/ Willis Simpson

Title Vice-Chairman

Date December 13, 1974

The signing of this agreement was authorized by a resolution of the governing body of the Orange County Soil and Water Conservation District
Local Organization
adopted at a meeting held on December 13, 1974

239 Wisner Ave.
Middletown, N. Y. 10940
Address Zip Code

/s/ William S. Pendergast
Secretary, Local Organization

Date December 13, 1974

Orange County Legislature
Local Organization

Orange County Government Center
Goshen, New York 10924
Address Zip Code

By /s/ Louis V. Mills

Title County Executive

Date December 17, 1974

The signing of this agreement was authorized by a resolution of the governing body of the County of Orange
Local Organization
adopted at a meeting held on December 16, 1974

/s/ Mary E. Earle
Secretary, Local Organization

Orange County Government Center
Goshen, New York 10924
Zip Code

Date December 17, 1974

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Appropriate and careful consideration has been given to the environmental aspects of this project.

Soil Conservation Service
United States Department of Agriculture

Approved by:

/s/ Robert L. Hilliard
State Conservationist

December 17, 1974
Date

# WATERSHED WORK PLAN

## CROMLINE CREEK WATERSHED

Orange County, New York

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

Prepared by: Orange County Legislature
Orange County Soil and Water Conservation District

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

April 1974

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CROMLINE CREEK WATERSHED

Orange County, New York

April 1974

# SUMMARY OF PLAN

Cromline Creek Watershed, located in Orange County, New York, has a drainage area of 13,920 acres. The Sponsoring Local Organizations are the Orange County Legislature and the Orange County Soil and Water Conservation District.

During the next ten years, it is anticipated that about 3,980 acres of cropland, open land formerly cropped, and forest land will be converted to urban uses. Accelerated erosion, estimated at 5,600 tons annually, is occurring on areas stripped of vegetative cover during construction.

Estimated average annual floodwater damages of $31,600 are occurring to crops and pasture. Indirect flood damages, including disruption of transportation and utilities, are estimated at $3,300.

In reach No. 1, an estimated 346 acres of muckland would be inundated by a 100-year flood frequency event. In addition, 94 acres of muckland would be damaged from "super saturation," although inundation would not occur. In reach No. 2, a 100-year event would inundate about 616 acres of cropland, pastureland, and forest land. Nine damaging floods have occurred during growing seasons since 1955. Flood depths of 4 feet and more have been recorded on the muck with flood durations lasting up to 3 days.

This plan provides for technical assistance for the installation of land treatment measures, the installation of one pumping plant and 2.1 miles of channel modification. The land treatment measures and structural measures will be installed during a 10-year installation period.

Installation of the land treatment measures will reduce soil losses on urban construction from 5,600 to 4,500 tons annually. Sediment concentrations at the mouth of the watershed will be reduced from 136 to 130 milligrams per liter.

An estimated 440 acres of muckland in reach No. 1 will receive direct and indirect benefits from planned project measures. Flooding from the 2-year frequency event will be reduced from 212 acres to zero; and for the 5-year event, 260 acres to 33 acres. Estimated average annual agricultural and indirect floodwater damages will be reduced about 74 percent.

Approximately 7 of the 13 acres of land committed to the construction of the channel and pumping plant are now in open land formerly cropped or are being used for the existing channel system. Six acres of muckland will be removed from agricultural production. About 3 acres of perennial weed growth on existing channel banks will be replaced by permanent seedings of grasses and legumes, providing nesting cover for songbirds and waterfowl. Muskrat activity in the channel will be temporarily disturbed during construction.

The Orange County Soil and Water Conservation District will be responsible for planning land treatment measures. Landowners and operators, with assistance furnished by the Soil Conservation Service and Forest Service, will be responsible for establishing and maintaining these practices. The Cromline Creek Small Watershed Protection District, to be established by the Orange County Legislature, will provide landrights, and the Soil Conservation Service will provide engineering services required for the installation of the structural measures. The Sponsors and the Service will bear project administration costs that each incurs.

Total installation cost of the combined land treatment and structural measures is about $647,750. Of this amount, $278,100 will be funded by P.L. 566 and $369,650 will be paid for by other funds. Total land treatment cost is $383,850, including $62,400 from P.L. 566 funds for technical assistance and $321,450 from other funds. Total structural measures cost is $263,900, including $215,700 from P.L. 566 funds and $48,200 from other funds.

The average annual operation and maintenance costs of $3,000 for the structural measures will be borne by the Cromline Creek Small Watershed Protection District and will be financed by taxes levied on the beneficiaries. The average annual cost of the structural measures is estimated to be $25,400. These measures are expected to produce average annual benefits of $42,500. The ratio of the total average annual benefits to the average annual cost of structural measures is 1.7 to 1.0.

All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigation by the Soil Conservation Service, U. S. Department of Agriculture.

# WATERSHED RESOURCES - ENVIRONMENTAL SETTING

## PHYSICAL DATA

Cromline Creek Watershed, comprising an area of 13,920 acres, is located in central Orange County in southeastern New York. It is located approximately 12 miles southeast of Middletown (population 22,600), 9 miles west of Harriman (population 950), and 45 miles northwest of New York City (population 7,894,800) (31). See the Watershed Location Map, Figure 1. Communities or villages, partially or totally, within the watershed include the incorporated village of Chester (population 1,600), and the unincorporated village of Walton Park (population 1,200).

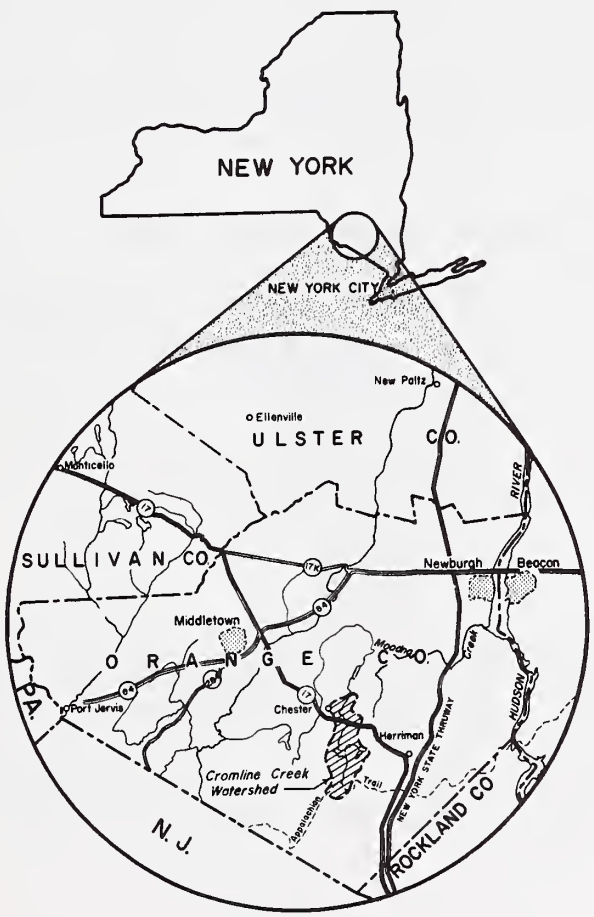



FIGURE 1 - WATERSHED LOCATION MAP

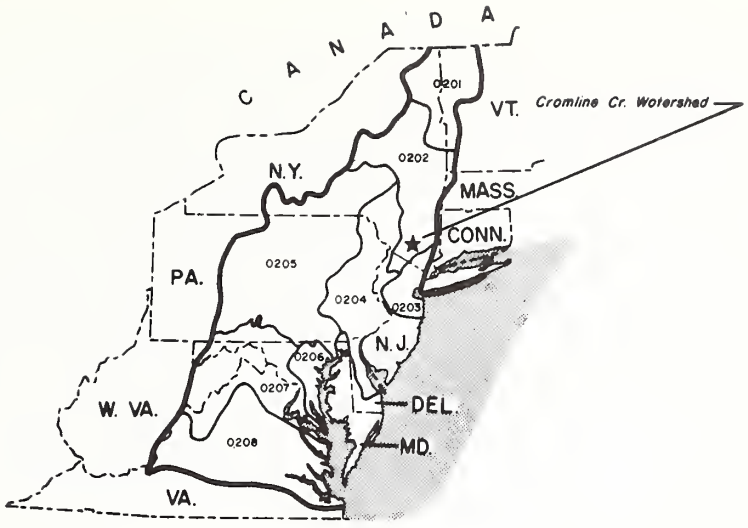
FIGURE 2

WATERSHED

RESOURCE

REGION

MAP




The watershed is located within the Water Resources Council's Mid-Atlantic Region and Upper Hudson River Basin Subregion (Watershed Resource Region Map, Figure 2). Table A illustrates present and projected populations and per capita income for the Water Resource Region and Subregion and for Cromline Creek Watershed. Cromline's per capita income reflects Orange County Data.

TABLE A - WATER RESOURCE REGION PROJECTIONS

| Year | Mid-Atlantic 2/ Region | Upper Hudson 2/ Subregion | Cromline Watershed |
|---|---|---|---|
| | | POPULATION | |
| 1970 | 38,518,110 | 2,058,700 | 3,900 |
| 1980 | 44,417,300 | 2,330,100 | 4,415 |
| 2000 | 57,553,700 | 2,951,500 | 5,590 |
| | | PER CAPITA INCOME (1967 $) | |
| 1970 | 3,918 | 3,307 | 3,057 1/ |
| 1980 | 5,381 | 4,745 | 4,387 |
| 2000 | 9,122 | 8,510 | 7,866 |

1/ U. S. Bureau of the Census; Census of Population: 1970 GENERAL SOCIAL AND ECONOMIC CHARACTERISTICS, Final Report PC(1)-C34 New York; U. S. Government Printing Office, Washington, D. C.

2/ U. S. Water Resources Council; 1972 OBERS PROJECTIONS: Regional Economic Activity in the U. S., Vol. 3, Water Resource Regions 1-8, U. S. Government Printing Office, Washington, D. C.

The soil and water resource problems include approximately 1,056 acres, subject to periodic inundation, located between the villages of Chester and Craigville. Channels in the problem area are adequate in depth and capacity for drainage; however, runoff from upland areas causes flooding. For evaluation purposes the flood problem area has been divided into two reaches. (See Project Map, Appendix A.) Reach one (used primarily for vegetable production) is known as the Chester Muck and includes all of the muck area on the west side of the Lehigh and Hudson River Railroad. Reach 2 (used for crop, pasture and forest production) consists of all the area subject to flooding from the confluence of Seely Brook and Youngs Brook to the watershed outlet at Craigville. Reach 2 includes both muck and mineral soils. Soil and water resource problems are also evident in upland areas of the watershed. Erosion damage occurs where steep topography, improper land use, overgrazing and urban development have limited or destroyed ground cover.

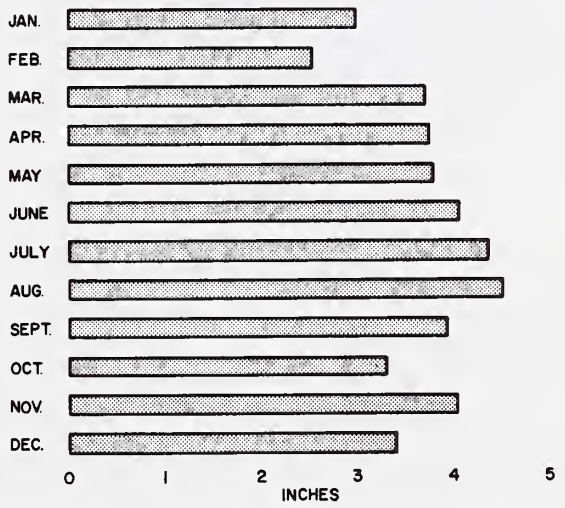



FIGURE 3 - MONTHLY PRECIPITATION DISTRIBUTION

Cromline Creek is in the Hudson Valley climate zone which is classified humid continental (13). Mean annual precipitation is about 44 inches, with a 180 growing season (May - September) precipitation of 20 inches (5) (Fig. 3, Monthly Precipitation Distribution). Mean annual temperature is 50° Fahrenheit (range of -16° to 98°) with a mean growing season temperature of 67°F (13).

The watershed lies in the Hudson Physiographic Province, a rolling terrain of glacial till-covered rocky ridges, with outwash and muck deposits in the valleys. The depth to bedrock varies with the terrain (4). The valleys and ridges lie in a general northeast to southwest direction. Elevations in the watershed range from 420 feet mean sea level at Craigville, to 1,386 m.s.l. at the headwaters of Trout Brook. There are several peaks over 1,000 feet in elevation. Goosepond Mountain located only 1 1/2 miles from the Chester muck area has an elevation of 1,061 m.s.l.

Bedrock in the southern part is a complex of sedimentary and metamorphic rocks, characterized by folding, faults, and upthrust areas. Rock types include shale, slate, sandstone, limestone, siltstone, conglomerate, dolomite, quartzite, and gneiss (10). These rocks range in age from pre-Cambrian through Devonian. Bedrock in the northern part is predominantly sedimentary in nature, primarily Snake Hill shale of the Trenton Group of Middle Ordovician age. Outcrops of most rock types occur throughout the area.

Glacial deposits are all of Wisconsin age and are primarily glacial till and glacial lake-laid sediments (4).

The upland soils are principally of the Langford-Erie-Rockland Association. These soils have developed in acidic glacial till from slate and sandstone. Also occurring in the upland is the Rockland-Nassau Association. Nassau soils are less than 20 inches to slate bedrock. Upland soils, stripped of vegetative cover, may experience erosion rates of from 5 to 223 tons annually. Investigations of urban construction sites reveal average erosion rates, on unprotected soils, of about 28 tons per year.

The formation of the organic soils is the result of a receding glacial lake. This lake was originally formed by a blockage in the vicinity of Craigville which could have been the result of the shale outcroppings, glacial till, or a combination of both. The lake was gradually filled by the deposition of sediment originating from the surrounding uplands, leaving a shallow swamp. Natural processes of eutrophication ensued. Decaying organic matter in this swamp produced the muck soils which, upon clearing and draining, become suitable for agricultural purposes. The depth of muck ranges from 12 inches to 5 feet or more.

The Carlisle muck soils are the most important agricultural soils in the valley. However, they require the installation of essential drainage measures for full use. Lake-laid silts and clays of the Canandaigua Soil Association occupy similar flat, wet areas of the valley. Some of the steeper sloped landforms near Chester are stratified outwash of the Hoosic Soil Association. These soils are very gravelly, moderately coarse textured, and have substrata consisting of water-sorted sand and gravel.

TA8LE 8 - PRESENT LAND USE

| Land Use 1/ | CAPABILITY SU8CLASS I Acres | IIe Acres | IIw Acres | IIs Acres | IIIe Acres | IIIw Acres | IIIs Acres | IVe Acres | IVw Acres | IVs Acres | Vw Acres | VIe Acres | VIs Acres | VIIs Acres | VIIIs Acres | VIIIw Acres | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cropland | | | | | | | | | | | | | | | | | |
| Mineral | | | 280 | 15 | 480 | 340 | 30 | | | | | | | | | | 1,145 |
| Muck | | | | | | 396 | | | 716 | | | | | | | | 1,112 |
| Open Land Formerly Cropped | | | | | | | | | | | | | | | | | |
| Mineral | 5 | 16 | 322 | 18 | 675 | 150 | 6 | 256 | 209 | 27 | 101 | 106 | | | | | 1,891 |
| Muck | | | | | | 43 | | | 80 | | | | | | | | 123 |
| Pastureland | | | 40 | | 10 | 30 | | 105 | 47 | 2 | 70 | | 65 | 21 | | | 390 |
| Forest Land | | | 8 | 304 | 560 | 505 | | 907 | 290 | | | 484 | 246 | 2089 | 797 | | 6,190 |
| Urban Land | 5 | 8 | 619 | 244 | 1015 | 173 | 23 | 57 | | 18 | | | 1 | 597 | | | 2,760 |
| Other Land | 22 | | | | 21 | | | 42 | 9 | 15 | | 9 | | 17 | | 34 | 169 |
| Water | | | | | | | | | | | | | | | | | 140 |
| TOTAL | 32 | 24 | 1,269 | 581 | 2,761 | 2,433 | 59 | 1,367 | 555 | 62 | 171 | 599 | 312 | 2,724 | 797 | 34 | 13,920 |

1/ Cropland - Land which is used for row crop, close-grown field crops, fallow, rotation hay and pasture, and hayland.
Open Land formerly cropped - Land which formerly had grown agricultural crops but is now undergoing natural plant succession.
Pastureland - Land producing forage plants for animal consumption.
Forest Land - Land at least 10 percent stocked or formerly stocked by forest trees noncommercial trees, and afforested (plantations) areas.
Urban Land - 8uilt-up areas, industrial and commercial sites, etc.
Other Land - Includes farmsteads, farm roads, feedlots, ditch banks, fence and hedgerows, marshes, and recreation areas.

Soils in the watershed have been grouped by land use into capability subclasses (Table B, Present Land Use). Land capability classification (26) is a system by which soils are grouped together by classes and subclasses, based on their limitations and hazards for agricultural use. Capability classes are designated by Roman numerals with limitations in use becoming progressively greater from Class I through Class VIII. Capability subclasses are a grouping of units having similar kinds of limitations and hazards. Four general kinds of limitations or hazards are recognized: (1) e, erosion; (2) w, wetness; (3) s, rooting zone limitations; and (4) c, climate.

Some forest land is contained in the undeveloped Goosepond Mountain State Park. The remaining forest land is owned by about 35 private landowners. Ownership ranges from 20-30 acres, in the northern watershed area, to tracts of several hundred acres in the southern highlands. The oak and oak-pine types with their associated species comprise most of the forest cover. In some low-lying areas the elm-ash-maple swamp hardwood type is present. In numerous areas, red cedar is encroaching on open land formerly cropped.

Predominant species in the natural forest cover include the oaks (red, white, and chestnut), maples (hard and red), white ash, various hickories, elm, black cherry, aspen, white pine, and hemlock. There are about 25 acres of plantations, mostly under 15 years of age, composed of various species of pine, spruce, and fir.

About 34 percent of the forest acreage is in sawtimber stands with 1,500 board feet or more per acre. Twenty-eight percent of the forest land is in pole-sized stands, and 38 percent is classed as seedlings or saplings.

The metallic mineral resources of the area include limonite and magnetite. The non-metallic resources include dolomite, clay, peat, serpentine, granite, sand, and gravel (20). The minerals that are or have been mined include peat, magnetite, sand, and gravel. The magnetite deposits lie in a belt which extends through Orange and Putnam Counties and passes through the southern portion of the watershed (21). In 1880, there were 26 mines in operation. The last mine closed in 1931. During the period of operation, 6,000,000 tons of furnace ore were produced (20). Sand and gravel is not extensively mined within the watershed, but rather it is excavated periodically by local landowners and/or contractors.

The village of Chester utilizes a well for public water supply which yields approximately 370 gallons per minute. Wells located on the muckland yield approximately 100 gal/min. Homeowners adjacent to the muckland utilize wells for domestic water supply. Wells are also used for supplemental irrigation of vegetable crops to promote uniform germination of seed. While specific yields are unknown, adequate supplies are always available. Ground water supplies exist throughout the remainder of the watershed and appear to be adequate. Yields range from 4-110 gallons per minute. Most of the aquifers are slate bedrock; however, the well producing 110 gal/min is in sand and gravel (9).

The major water course (Project Map, Appendix A) flows northward, from where it originates in the eastern edge of the town of Warwick, to the watershed boundary near Craigville. From the southern watershed boundary to the confluence with the Walton Lake tributary, the stream is known as Trout Brook. From this confluence to Route 17 the stream is known as Seely Brook. Immediately north of Route 17

Seely Brook is joined by Youngs Brook, originating in the east-central portion of the watershed near the community of Monroe, to form Cromline Creek. Cromline Creek flows north-northeast past the muckland area, picking up the tributary from the Chester Muck to outlet at the lower watershed limit near Craigville.

Cromline Creek flows northward from Craigville, through Tomahawk Lake to join Otter Kill. Moodna Creek, formed at the confluence of Cromline and Otter Kill, flows eastward to empty into the Hudson River near Cornwall (Fig. 1, Watershed Location Map, page 4).

Drainage from the muckland is achieved through a system of manmade laterals and mains which carry the water to Cromline Creek. The main channel through the Chester Muck originates in the upland south of Route 17, entering the muckland on the south side. It continues northeast to pass under Greycourt Avenue, Erie Railroad, and the Lehigh and Hudson River Railroad. Several laterals in the north part of the muck drain under the L&HR Railroad to join directly with the main channel in reach 2. The drainage system in reach 2 consists of a system of interconnected laterals draining to the Chester Muck tributary and Cromline Creek.

Table C provides a physical description and a description of fisheries habitat found in various watershed streams. Identification of the streams is provided on the Fisheries Resource Map, Figure 4. Small mammals, birds, reptiles and amphibians, using streamside habitat, may be found in Appendix B.

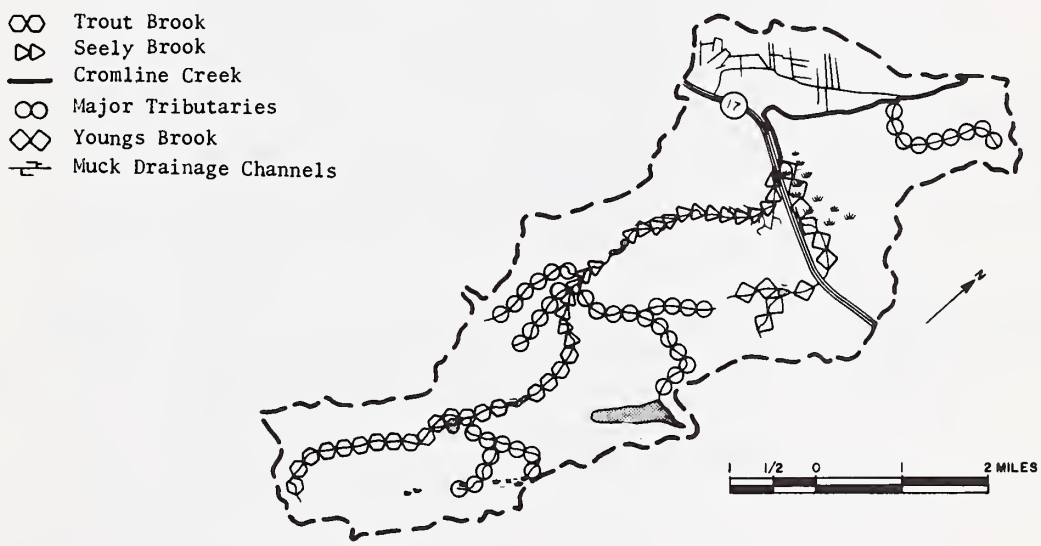



FIGURE 4 - FISHERIES RESOURCE MAP

TABLE C - STREAM PHYSICAL AND FISHERY DATA

| Stream Designation | Length | Physical Description | Fishery 1/ |
|---|---|---|---|
| Trout Brook | 4.1 Miles | Well-defined natural channel of moderately steep gradient. Bottom material is gravel and rubble. Pools represent less than 35 percent of the channel length. Average stream width is 18 feet with pool depths of 18-24 inches and riffle depths of 8-10 inches. Vegetative shade cover (80-90 percent) is comprised of oak, maple, ash, hickory, white pine, and hemlock forests; with dogwood, willow, and alder in the open areas. | Low to moderate quality brown and brook trout fishery - maintained by natural reproduction. 2/ |
| Seely Brook | 4.5 Miles | Well-defined natural channel with a relatively flat gradient. Riffles represent less than 10 percent as bottom material is mainly silt, with some sand and gravel. Average stream width is 20 feet with pools reaching depths of 40-50 inches. Vegetative shade cover (80 percent) is comprised of dogwood, willow, alder, and mixed perennial weeds, predominently goldenrod. | Low quality warm water fishery containing dominantly pickerel, small and largemouth bass. and cutlip minnows. |
| Cromline Creek | 3.6 Miles | A previously modified channel with flat gradient. Riffles are nonexistent; silt and sand comprise the bed materials. The stream varies from 18-20 feet wide, with depths ranging from 24-30 inches. Vegetative cover is predominantly mixed perennial weeds, such as goldenrod, with some dogwood and willow. Approximately 40-50 percent shade is provided. | Low quality warm water fishery for pickerel, large and smallmouth bass, bluegill, cutless minnow, killifish, bullheads, crappies, and rockbass. |
| Youngs Brook | 3.4 Miles | Well-defined natural channel with pools representing less than 50 percent of the length. Bottom material is gravel rubble, south of route 17, and silt and sand, north of route 17. Width varies from 8-10 feet, and pool depths are less than 18 inches. Vegetative shade cover (30 percent) is comprised of red maple-elm forests and perennial weeds and grasses. | Local observations reveal that no sport fishery exists. |
| Major Tributaries | 10.0 Miles | Well-defined natural channels. Pools are nonexistent. Flow depth is approximately 12 inches with stream widths of 6 feet and less. Bottom materials range from gravel rubble, in the headwaters, to silt and sand at the outlet. Vegetative shade cover varies from 0 to 100 percent. | Local observations reveal that no sport fishery exists. |
| Muck Drainage Channels | Unknown | The channels are manmade with a flat gradient. Main channels average 12 feet in width, while laterals average 8 feet or less. Depth of flow is 12 inches. Bottom materials consist of silt and muck. Vegetative shade cover (0-5 percent) is comprised of a limited amount of perennial weeds and grasses. | Local observations reveal that no sport fishery exists. |

1/ NYS DEC Field records.
2/ Limited due to lack of pools.

Classification, type of channel, and flow conditions for the streams, defined by the New York State Department of Environmental Conservation, are presented in Table D.

TABLE D - STREAM CLASSIFICATION

| Stream 2/ | Type of Channel | Flow Condition 1/ | Water Quality Classification 1/ |
|---|---|---|---|
| Trout Brook | Well-defined natural | Perennial | CT |
| Seely Brook | Well-defined natural | Perennial | D |
| Youngs Brook | Well-defined natural | Perennial | D |
| Cromline Creek | Previously modified | Perennial | C |
| Moodna | Previously modified | Perennial | C |

1/ Classification and standards governing the Quality and Purity of Waters of New York State (Parts 700-703, Title 6, Official Compilation of Codes, Rules, and Regulations), New York State Department of Environmental Conservation, Albany, New York.

2/ Tributaries and subtributaries to these streams, including channels draining the muckland, are classed D and Walton Lake is classed A.

Definitions of water quality classifications for best usage are as follows:

Class A: Source of water supply for drinking (if subjected to approved treatment), culinary or food processing purposes, and any other usages.

Class C: Fishing and any other usages except for bathing or as source of water supply for drinking, culinary, or food processing purposes. (Class CT indicates trout stream)

Class D: Agricultural or source of industrial cooling or process water supply and any other usage except for fishing, bathing, or as source of water supply for drinking, culinary, or food processing purposes.

In September 1974, a sample of bottom material was collected from Cromline Creek near Chester to analyze for pesticide concentrations. Results of this analysis is shown in Appendix B, page B-9. No values were reportable for Aldrin due to interference of other pesticides.

Chemical analyses were made of water samples taken from Moodna Creek (downstream from Cromline Creek) near New Windsor from April 1969 to September 1970, by the New York State Department of Environmental Conservation. Table E illustrates the results obtained (all units in milligram per liter unless specified). See Watershed Location Map (Figure 1, Page 4) for location of Moodna Creek.

TABLE E - WATER QUALITY DATA - MOODNA CREEK

| Parameter | Low | Ave. | High | Parameter | Low | Ave. | High |
|---|---|---|---|---|---|---|---|
| pH (units) | 6.6 | 7.3 | 7.8 | Iron (FE) | 40 | 146 | 540 |
| Organic | .08 | .37 | 1.5 | Mang. (MN) | 0 | 97 | 650 |
| Ammonia | .02 | 1.2 | 12 | Chloride | 19 | 35 | 67 |
| Nitrite | .02 | .21 | 1.7 | Fluoride | 0 | .2 | .9 |
| Nitrate | 0 | 2.7 | 11 | Silica ($SiO_2$) | .9 | 4.1 | 6.2 |
| Phosphorus | .18 | .59 | 1.6 | Dissolved (CA) | 22 | 33 | 44 |
| COD | 5 | 22 | 80 | Dissolved (MG) | 3.8 | 5.3 | 7.0 |
| Dissolved Solids | 129 | 189 | 281 | Sodium (NA) | 10 | 21 | 39 |
| Conductance (Micromhos) | 209 | 330 | 521 | Potassium (K) | 1.2 | 1.9 | 3.4 |
| | | | | Carbonate ($CO_3$) | 0 | 0 | 0 |
| Alkalinity | 39 | 75 | 156 | Methylene Blue | .02 | .09 | .28 |
| Hardness (CA, MG) | 73 | 105 | 138 | Silicate ($SO_4$) | 24 | 31 | 47 |
| Non.Carb.Hardness | 0 | 29 | 41 | Dissolved | 120 | 182 | 306 |
| Bicarbonate ($HCO_3$) | 48 | 92 | 190 | Solids (SUM) | | | |
| Color $P_t$-CO) | 16 | 35 | 90 | Ignition Loss | 3 | 19 | 39 |

Stream gage records within the watershed are limited. Stage discharge and water temperature recordings have been made on Seely Brook for a period from May 1964 to September 1968. Normally water temperatures exceed 65 degrees during the mid-June to August period. Figure 5 depicts the percent of time any given temperature was equaled or exceeded during the 1967 water year. Flow duration for the same period is shown in Figure 6. The maximum discharge recorded, for the period of record, was 497 cubic feet per second on May 29, 1968. The minimum discharge was 0.02 cubic feet per second on September 18, 1964.

Total runoff can be considered to be divided into two parts: Storm, or direct runoff and base flow. Direct runoff is presumed to consist of overland flow; whereas, base flow is considered to be largely from ground water accretion. Seasonal variation of base flow is apparent from the gaged records. An investigation of regionalized data indicates that an average annual rate of runoff of 1.5 cubic feet per second per square mile of drainage would be typical of this area.

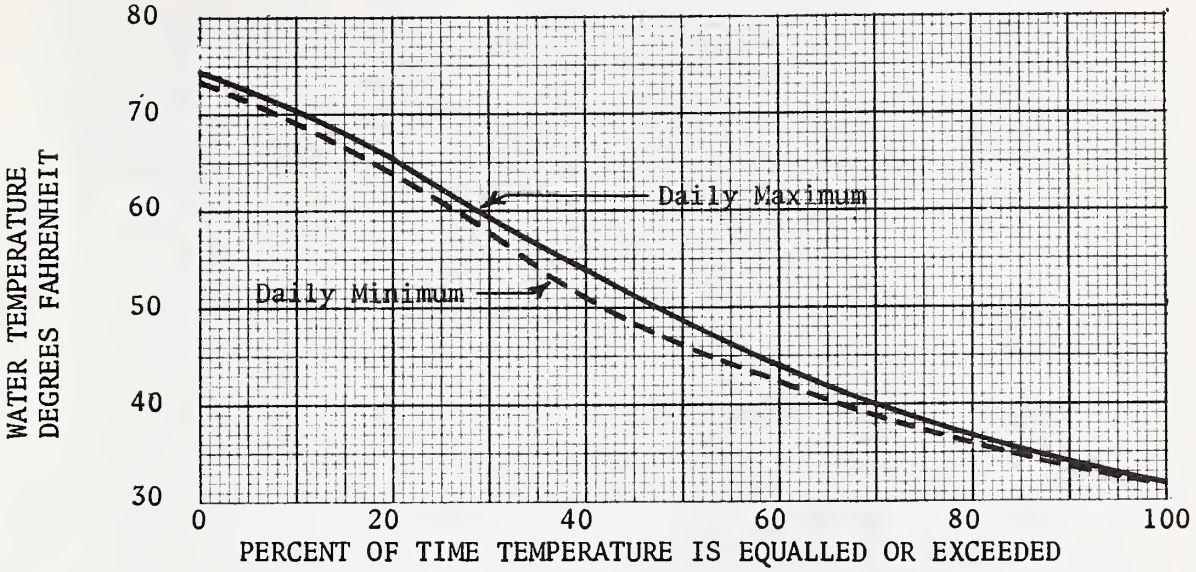



FIGURE 5 - SEELY BROOK - WATER TEMPERATURE DURATION 1/

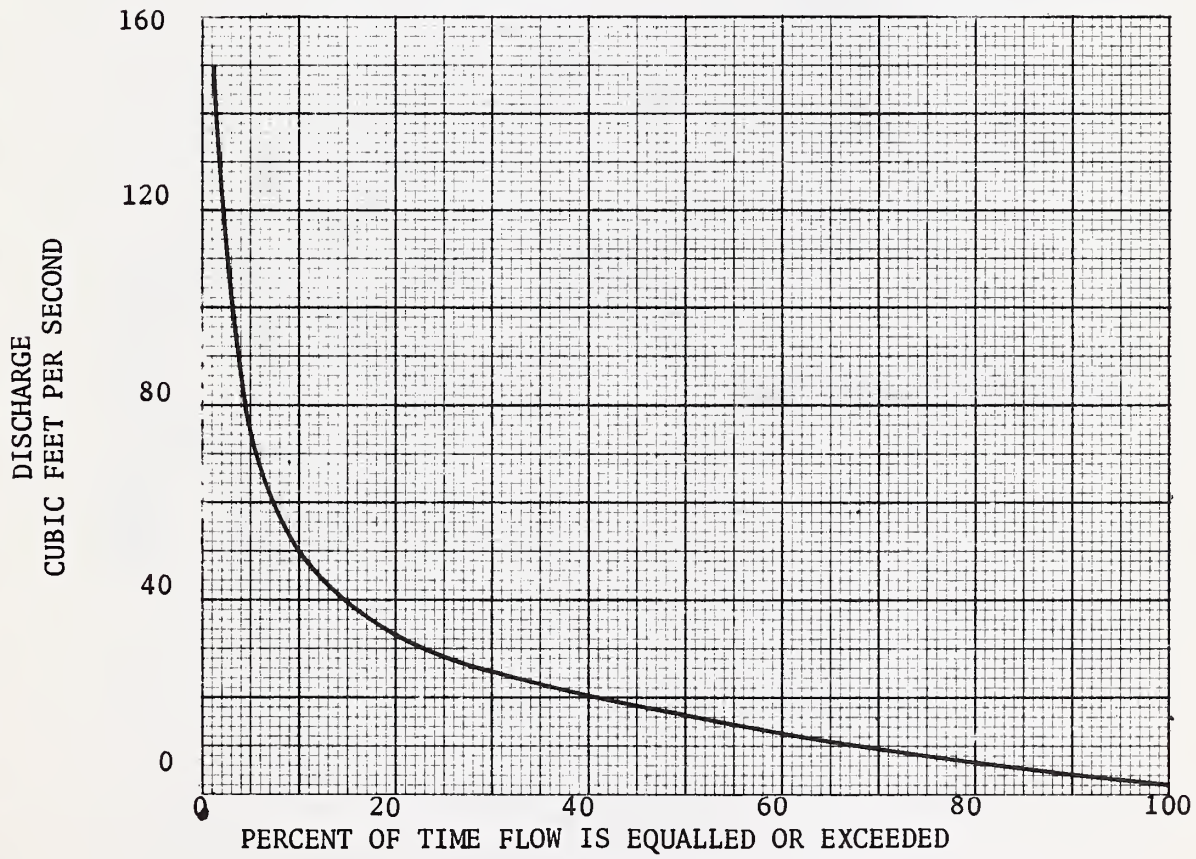



FIGURE 6 - SEELY BROOK - FLOW DURATION 1/

1/ Water Year from October 1966 to September 1967
Source: Water Resource Data for New York, USDI, Geological Survey

Walton Lake, with about 120 surface acres and about 2.4 miles of shoreline, is the largest body of open water in the watershed. There are also 4 small lakes ranging in size from 2 to 5 acres and about 43 ponds of less than one acre in size (Figure 7, Wildlife Habitat Resources Map). Table F provides a description of lakes and ponds.

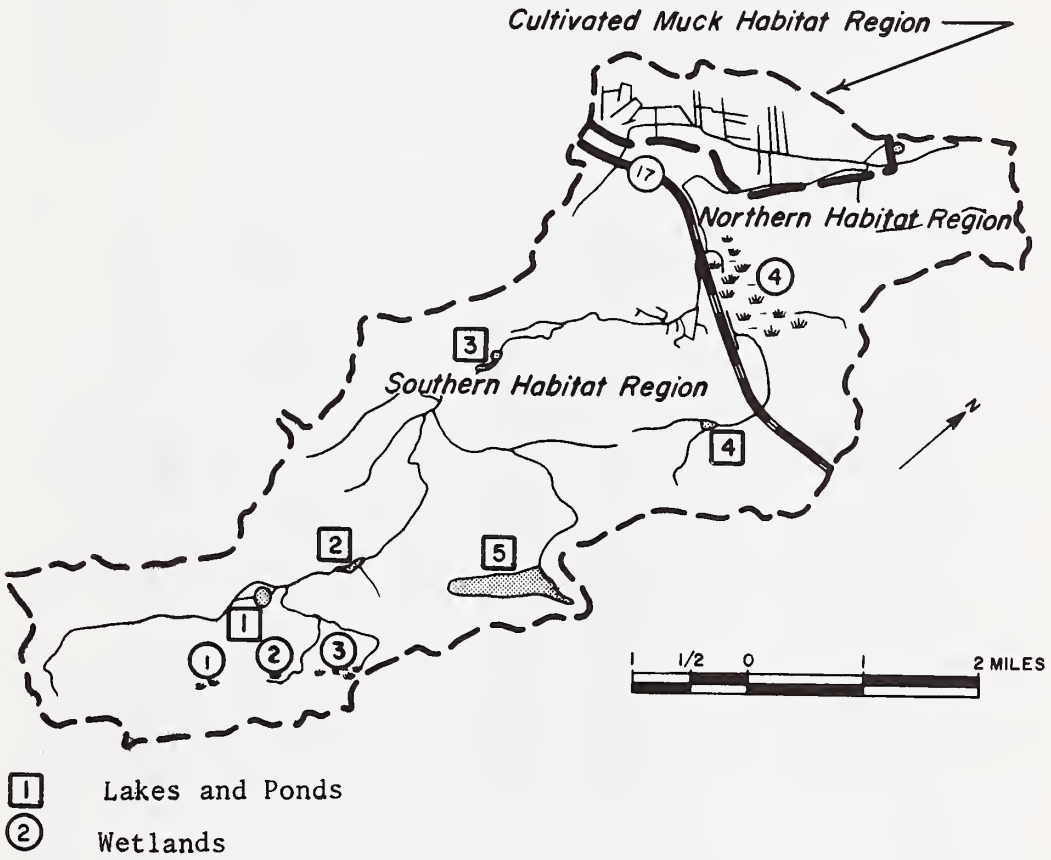



FIGURE 7 - WILDLIFE HABITAT RESOURCES MAP

TABLE F - OPEN WATER PHYSICAL AND FISHERY RESOURCES DESCRIPTION

| No. | Name | Size | Description | Sport Fishery Resource 1/ |
|---|---|---|---|---|
| 1 | Bull Pond | 5 acres | Manmade private pond for water-based recreation during summer months | No reported sport fishery |
| 2 | Unnamed | 2 acres | Small manmade private pond for water-based recreation during summer months. Water is not stored within the pond during winter months | No reported sport fishery |
| 3 | Unnamed | 2 acres | Long, narrow manmade pond of shallow depth | Warm water species, such as pickerel, small and largemouth bass |
| 4 | Unnamed | 5 acres | Manmade private pond constructed for summer water-based recreation | No reported sport fishery |
| 5 | Walton Lake | 120 acres | Natural lake with a maximum depth of 67 feet. Public access is provided | Largemouth bass, rainbow trout, brown trout, bluegills, pumpkinseeds, brown bullheads, yellow perch and rock bass. The State Division of Fish and Wildlife stocks 4,000 fingerling brown trout annually |
| - | Unidentified | Various | Approximately 43 other small private ponds (less than 1 acre) exist throughout the watershed | Warm water largemouth bass and bluegills |

1/ New York State Department of Environmental Conservation Field Records.

Table G illustrates types and quantities of wetlands identified in the watershed. The predominant vegetation found in these wetlands, by wetland type, include: Type 2 - sedges, rushes, and grasses; Type 3 - cattails, arrowheads, and reeds; Type 4 - cattails, reeds, bulrushes, pondweeds, waterweeds, and duckweeds; Type 6 - alders, buttonbush, and dogwoods; and Type 7 - red maple and elm. Wetland locations are shown on Figure 7, Wildlife Habitat Resources Map.

TABLE G - WETLAND RESOURCE DATA

| Wetland No. | Acres | Acres by Wetland Type 1/ | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 6 | 7 |
| 1 | 11 | | | | | 11 |
| 2 | 9 | | | | | 9 |
| 3 | 21 | | | | | 21 |
| 4 | 170 | 42 | 36 | 10 | 32 | 50 |

1/ "Wetlands of the United States," U.S. Department of the Interior, Fish and Wildlife Service, Circular C-39 (25).

## ECONOMIC DATA

About 86 percent of the watershed is in private ownership and about 14 percent is owned by the State of New York. State owned property includes the 1,559 acre Goosepond Mountain State Park and highway rights-of-way. The city of New York owns 100 acres of crop and pastureland in reach 2.

Lettuce is double-cropped and is grown on about 59 percent of the muck area; onions are grown on approximately 40 percent. A few acres of miscellaneous vegetable crops, including tomatoes, spinach, sweet corn, squash, and beans are grown for local consumption. Yields of onions, on the muckland, in a flood-free year range from 375 to 675 hundredweight (cwt) per acre for an average of 553 cwt/acre. Lettuce yields, in a flood-free year, range from 205 to 240 cwt for an average of 220 cwt/acre. There are about 10 muck (vegetable) farms averaging 45 acres in size in the watershed.

Dairy support crops of corn for silage, alfalfa, grass hay, and pasture are the principal crops on upland farms. Some corn is harvested for grain, but is usually done because this corn is in excess of needs for silage rather than being specifically planted for grain. Pastureland often has limitations, such as being too stony, shallow, steep or wet. Corn silage yields range from 15 to 30 tons per acre, averaging 20 tons/acre. Hay yields average 5 tons/acre for alfalfa and mixed hay and 1 1/2 tons for grass hay. There are about 6 dairy farms averaging about 160 acres in size.

Orange County produced 2,118 thousand hundredweight (15), or about 7.5 percent of the 28,809 thousand hundredweight (17) of onions produced in the United States in 1967. Storage and marketing facilities are well established locally. The dairy production is utilized locally and in the metropolitan market. A slaughter house at Chester provides a market for veal calves and slaughter cows.

The population of the watershed was estimated to be about 3,900 in 1970, of which 1,600 (31) live in the incorporated village of Chester, and 1,200 live in the unincorporated Walton Lake community. Approximately 120 people live on commercial farms and the balance live in rural residences. See Table A, page 5 for Water Resource Region and Subregion and Watershed Population and Per Capita Income Data.

Muckland values are about $1,500 per acre with cash rental averages of about $75 per acre per year. Farmland, in upland areas, sells for $3,000 or more per acre, due to residential development and speculation.

The watershed is located on a major corridor of commerce. A main line of the Erie-Lackawanna Railroad intersects with the Lehigh and Hudson River Railroad at Chester. New York Route 17 (a four lane limited access road) connects the New York State Thruway with southern tier counties of New York, Pennsylvania, and southern New England. Interstate Highway 84 lies a few miles to the northwest of Chester. Farm to market roads are good to excellent. The New York City Metropolitan Area markets are about an hour's drive (Figure 1, Watershed Location Map, page 4).

Forest products are an integral part of the economy. There are no sawmills within the watershed boundary; however, one permanent mill is located west of the watershed and several other mills are within a reasonable hauling distance. Veneer and sawlogs are in demand, as are low grade logs for pallets. Several mines in New Jersey provide an outlet for pilings and mine props. Wood for fuel is also in demand, but there is no local market for pulpwood.

Many small industries, including printing plants, textile sewing factories, and electrical equipment manufacturers, provide local employment. The economic security of the watershed appears to be favorable as it is not completely dependent on the success or failure of any one industry or enterprise. The November, 1973 unemployment rate in the New York Metropolitan Area was about 4.5 percent (19).

## FISH AND WILDLIFE RESOURCES

Fishery resources vary from cold to warm water in both lakes and streams. The Fisheries Resource Map (Fig. 4, page 10) locates major watershed lakes and streams. Physical description of the streams and their sport fisheries may be found on Table C, page 11. Lakes and pond fisheries descriptions are presented on Table F, page 16.

Public fishing is limited to Walton Lake. Goosepond State Park, through which Seely Brook flows, is a fish and wildlife sanctuary. No public fishing rights for stream fisheries exist; however, fishing access across private land may be obtained through landowner permission.

Wildlife species can be classified in accordance with principal types of habitat required, such as forest, agricultural, and wetland. The habitat area south of Route 17 is generally classified as forest. The area north of Route 17 is generally classified as agricultural with interspersed wetlands. Table H displays population densities by habitat areas of the watershed (Wildlife Habitat Resource Map, Fig. 7, page 15).

The southern habitat region (south of Route 17) provides forest land, forest edges, thickets along streams, and open land formerly cropped (in stages of succession), for forest wildlife species Mature hardwood forests (oak-hickory), with shrubs and low growing cover, provide habitat for gray squirrels and grouse. The interspersion of open land formerly cropped and brushy streambanks provides habitat for deer. Nongame species of this region may be found in the listings of Appendix B.

The northern habitat region (north of Route 17), primarily provides habitat for agricultural wildlife species. Rabbits are more abundant in the hedgerows and odd areas bordering hayfields. Pheasants and quail are found in the region but the limited production of grain crops restricts these populations. Other species found in the agricultural areas include raccoons, skunks, red foxes, woodchucks, weasels, opossums, crows, hawks, owls, and songbirds.

The cultivated muck habitat region provides limited agricultural habitat. Vegetative cover is limited to sparse weedy cover along drainage ditches. Wildlife within the region consists primarily of songbirds and muskrats. (See Appendix B.)

Wetland wildlife species exist in various quantities throughout the watershed. Aquatic furbearers such as muskrat, are abundant in all lakes, streams, and wetlands. Migratory waterfowl use these areas for resting, with some remaining to rear young. Woodcock use the wetlands and odd moist areas during migration.

Access for public hunting is limited due to land development and posting of private land. Songbirds and other nongame species of wildlife, however, are becoming increasingly important as rural residents develop the area as a "place in the country." They find enjoyment in observing both game and nongame wildlife species.

Designated rare and endangered species are listed in the publication "Rare and Endangered Fish and Wildlife of the United States," U. S. Bureau of Sport Fisheries and Wildlife, 1966 Edition. Investigations indicate that none of the species listed in the publication have habitat in the watershed.

TABLE H - ESTIMATED WILDLIFE POPULATIONS BY HABITAT AREAS

| Area | Species | Population Estimated | Density of Population |
|---|---|---|---|
| South of Route 17 | White-tailed deer | Above carrying capacity | 25 per sq. mi. |
| | Ruffed grouse | Moderate | 1 per 10 acres |
| | Grey squirrel | Moderate | 1 per 10 acres |
| | Cottontail rabbit | Low | 1 per 40 acres |
| North of Route 17 | White-tailed deer | Low | 2 per sq. mi. |
| | Ruffed grouse | Low | 1 per 40 acres |
| | Ringnecked pheasants | Low | 1 per 50 acres |
| | Bobwhite quail | Some | 2 coveys (15 per covey) |
| | Cottontail rabbits | Medium | 1 per 10 acres |
| | Woodcock | Migrants | 50 birds |
| | Waterfowl | Moderate use of wetland, channels and lower Cromline Creek | |
| | Muskrats | Low | Unknown |
| Cultivated | Essentially no game species | | |
| Muck | Some songbirds use edges of muck | | |
| | Muskrats (some in channel banks) | | |
| | Waterfowl (occasional migration use of channels) | | |

## RECREATIONAL RESOURCES

The New York Metropolitan Region is generously endowed with natural resources and has a variety of topographic and geological features that provide points of natural interest. Many of the natural resources have been officially recognized and protected: The Palisades, the shorelines, lakes, reservoirs, and natural highlands forming New York City's park system and Harriman State Park; the beaches and natural shoreline areas of Long Island; and much of the Catskill, Shawangunk, and Taconic Mountain Ranges (20). (See Figure 8, Local Area of Influence Map.)

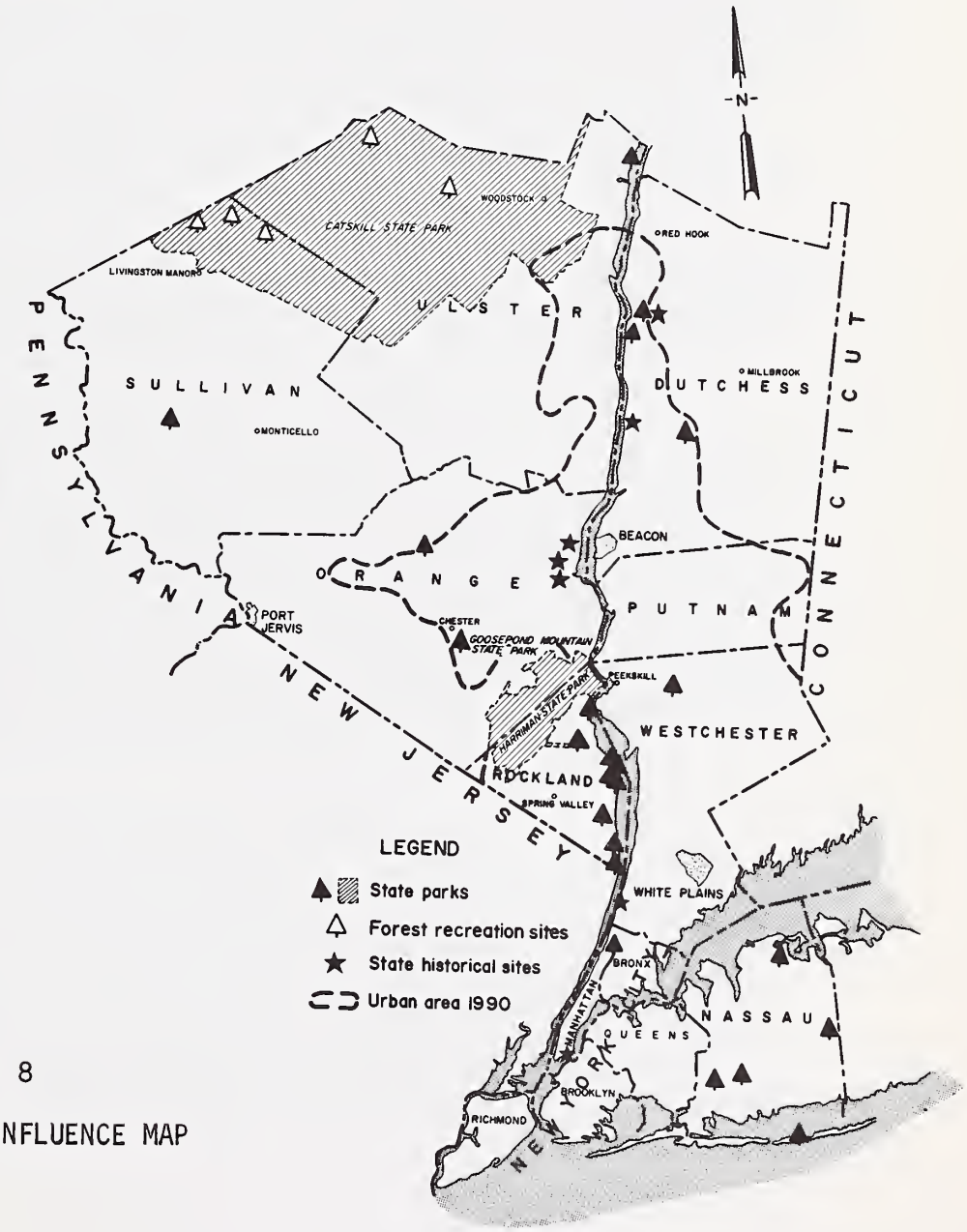



FIGURE 8

LOCAL AREA OF INFLUENCE MAP

The State of New York has plans for development of the 1,559 acre Goosepond Mountain State Park (17). Programmed facilities include water access for boating and canoeing, several camping and picnicking areas, a swimming pool and two 18-hole golf courses. Winter sports facilities will include two ski areas with lifts.

Hiking participation is forecasted to grow by 23.4 percent from 1970 to 1990 (20). Hiking, by definition, includes informal hikers, walking for pleasure, and backpackers. Informal hikers generally look for two to four mile trail loops, preferably with scenic overlooks and near to other, more developed, recreation areas. In contrast, backpackers will follow major trail sections in the wilderness areas of the state. The Appalachian Trail, a wilderness footpath extending 2,015 miles from Maine to Georgia, crosses the southern end of the watershed. On October 2, 1968, President Lyndon B. Johnson signed into law the National Trails System Act, establishing the Appalachian Trail as a federally protected trail (8).

Water-based recreation within the watershed is limited to Walton Lake and the smaller lakes and ponds (Table F on page 16, and Fig. 4 on page 10). All of the land around the lakes and ponds is privately owned; however, public access is provided on Walton Lake.

## ARCHEOLOGICAL, HISTORICAL VALUES AND UNIQUE SCENIC AREAS

There are no known historical or archeological materials or data in the watershed. The National Register of Historic Places lists no properties in the watershed such as historic districts, sites, buildings, structures, or objects which are significant in American history, architecture, archeology, and culture. The Division of Historical Preservation, New York State Parks and Recreation, indicated the potential exists that remains of mastodons and other prehistoric animals may be found in the muckland. See Appendix C for the Archeological Reconnaissance Report.

## SOIL, WATER AND PLANT MANAGEMENT STATUS

It is estimated that land developers will convert 230 acres of forest land and 170 acres of open land formerly cropped to urban development each year for the next 10 years. This is an estimated total of 400 acres that is stripped of vegetative cover each year for construction purposes. A recent survey indicates that nearly all of the 1,145 acres of land presently in farms used for dairying are owned by, or are under option to, real estate agencies for development of housing. Table I illustrates land use expected in the year 2000.

TABLE I - FUTURE LAND USE (2000)

| Land Use | Acres | Percent |
|---|---|---|
| Cropland | 1,112 | 8.0 |
| Open land formerly cropped | 788 | 5.7 |
| Pastureland | 42 | 0.3 |
| Forest land | 1,542 | 11.1 |
| Urban land | 10,125 | 72.7 |
| Other land | 171 | 1.2 |
| Water | 140 | 1.0 |
| TOTAL | 13,920 | 100.0 |

Approximately 65 percent of the cropland, 80 percent of the pastureland, 95 percent of the urban land, and 95 percent of the other land have been adequately treated. Land "adequately treated" is defined as land on which all planned improvements have been applied.

Nearly all of the land in the watershed is adequately protected. Land "adequately protected" is defined as land on which the soil, water, and related plant resources are adequately protected from deterioration, either naturally or by action of the land user.

On 440 acres of muck used for vegetable crops, the factors of production (land, labor and capital), are not being efficiently employed. The costs of maintaining land treatment measures and of establishing crops are increased due to the flood hazard.

The Orange County Soil and Water Conservation District has an active program for land use planning and installing land treatment measures. There are 70 operating units in the watershed, however, only 19 are managed primarily to produce income from agricultural and forest products. Of these, there are 10 who are district cooperators with basic conservation plans covering 430 acres.

Orange County land use regulations prohibit urban development on slopes exceeding 20 percent, areas subject to ponding, muck soils, soils unsuitable for septic tank effluent (except where other means of disposal are planned), soils where the water table cannot be adequately controlled with foundation drains, and wetlands. A flood plain study of Cromline Creek, conducted by the Soil Conservation Service, is utilized in land use regulation development.

# WATER AND RELATED LAND RESOURCE PROBLEMS

## LAND TREATMENT

About 400 acres of cropland (muck) need improved water table control. Other lands having significant problems are those being stripped of vegetation and converted, by construction of housing and other developments, to urban uses. It is anticipated that about 3,980 acres, at the rate of 400 acres per year, will be converted during the next 10 years. This land, which includes 2,300 acres of forest, stripped of vegetative cover will be subjected to accelerated erosion and site deterioration. At any given time during the year, it is estimated that there will be about one-half of the 400 acres exposed to erosion and the soil losses will be as indicated in the "Erosion Damage" section.

The development of new subdivisions will result in the loss or reduced value of wildlife habitat and aesthetic resources. Natural surface drainage will be changed due to grading operations, diversions, and streets. A decrease in the area of soil which can absorb water will occur because of construction of streets, buildings, sidewalks, and parking lots. Subsurface materials will be exposed that are too rocky, too acid, or otherwise unfavorable for establishing plants.

Land, labor, and capital are being employed inefficiently to forest land where management guidelines are lacking. Trees are being harvested indiscriminately, tree stands need improving, and erosion is occurring on skid trails and access roads.

Table J shows soil limitations that will be encountered during urban and other developments and their approximate extent in the watershed.

TABLE J - SOIL LIMITATIONS AFFECTING USE FOR COMMUNITY DEVELOPMENT

| Limiting Characteristics 1/ | Approximate Extent (Acres) |
|---|---|
| Wetness (High Seasonal Water Table) | 1,830 |
| Restrictive Layer (Fragipan) | 5,130 |
| Shallow (Bedrock at < 20 inches) | 4,180 |
| Excessive Stoniness | 910 |
| Slopes Exceeding 15 percent | 3,870 |

1/ Some areas may have more than one soil limitation

## FLOODWATER DAMAGE

The major floodwater damages occur on the muckland. Bedrock exposed at the surface of the Cromline Creek channel, from the bridge at Craigville south for three-fourths of a mile, has restricted the creek to a narrow, shallow channel between the outcropping rock ridges. Runoff from heavy rains upstream is trapped behind this restriction, causing flooding and damage to crops on the flood plain. Flood damages were evaluated in reaches No. 1 and No. 2. (Project Map, Appendix A). Flood damages were not evaluated on upstream reaches.

In reach No. 1, an estimated 346 acres of muckland would be inundated by a 100-year 1/ flood frequency event. (Reach No. 1, Flood Plain Map, Appendix A). In addition, 94 acres of muckland would be damaged from "super saturation," although inundation would not occur. Muckland inundated by 2-,5-,10-, and 100-year frequency events are shown on Table 0 page 44. In reach No. 2, a 100-year flood frequency event would inundate about 616 acres of cropland, pasture, and forest land.

Estimated average annual floodwater damages of $31,600 are occurring to crops and pasture. Indirect flood damages, including disruption of transportation and utilities, are estimated at $3,300. (See Table 5.) Average annual crop and pasture floodwater damages of $24,900 and indirect flood damages of $2,500 are occurring in reach No. 1, while crop and pasture floodwater damages of $6,700 and indirect flood damages of $800 are occurring in reach No. 2.

Nine damaging floods have occurred during growing seasons since 1955. In 1969, a 2-year frequency flood event occurred in late spring, and a 5-year frequency flood event occurred in late fall causing damage to lettuce and onion crops estimated at over $60,500. Water depths up to four feet and durations up to three days on the muck have been reported.

Ten commercial farms in reach No. 1 and three commercial farms in reach No. 2 are being directly affected by flood damages. An average of 4 man-years of employment (storage and processing activities) are lost annually due to reduced production of agricultural products. The estimated value of land and improvements subject to flood damage in Cromline Creek Watershed is about $646,000.

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1/ A "100-year" flood frequency event indicates the probability that a flood of this size will be equaled or exceeded (on the average) once in 100 years or has a one percent chance of being equaled or exceeded during a given year.

## EROSION DAMAGE

Erosion, or the wearing away of land surface by running water, wind, ice, or other geological agents, is occurring throughout the watershed. Erosion rates are generally less than one ton per acre per year. Present land use, consisting largely of forest land and open land formerly cropped, provides the necessary cover to keep sheet and streambank erosion to a minimum.

Sheet erosion is the removal of a fairly uniform layer of soil from the land surface by runoff water. Sheet erosion by land use in Cromline Creek Watershed is shown on Table K.

TABLE K - SHEET EROSION RATES

| Land Use | Tons/Acre/Year |
|---|---|
| Cropland | 1.90 |
| Pastureland | .75 |
| Open Land Formerly Cropped | .15 |
| Forest Land | .24 |
| Urban Land 1/ | .20 |
| Other Land 2/ | .25 |

1/ Established Urban
2/ Recreation land, farmsteads, farm roads, feedlots, ditch banks, fence, and hedgerows, and marshes.

About 30 percent of the watershed consists of very steep slopes with little soil cover or rock outcrops. Slopes of agricultural land, suitable for urban development, range from 4 to 15 percent and average 200 feet in length. The forest land and open land formerly cropped are generally located on steeper slopes of lengths less than 200 feet.

The erosion rates for the 400 acres disturbed annually by urban construction, without protective measures, will be approximately 28 tons per acre per year. These rates continue until suitable vegetative cover or other measures are established. The establishment period for adequate vegetative cover is usually 3 to 12 months after seeding.

Erosion rates on cropland are well within allowable limits; hence, there is no significant effect on agricultural production in the watershed.

## SEDIMENT DAMAGE

Sediment is deposited over a period of time in stream channels and lower lying watershed areas. These sediments have the potential to pollute the water, reduce stream channel capacity (thereby increasing out-of-bank flooding), and destroy fishery habitat. To date, there is no known effect on water quality due to sedimentation. No monetary losses, due to sediment, have been reported or identified.

The sediment discharge at the mouth of the watershed is estimated to be 5,200 tons annually. This represents a sediment concentration of 136 milligrams per liter.

Erosion induced by urbanization produces about 5,600 tons of sediment annually. About 840 tons (15 percent) reaches the mouth of the watershed; whereas, the remaining 85 percent remains in the streams or is deposited on low-lying areas.

## FISH AND WILDLIFE

Urban encroachment into existing wildlife habitat is the most significant fish and wildlife problem. Land use changes, such as conversion of agricultural land to residential or industrial activities, permanently destroys wildlife habitat and restricts hunting and wildlife management on surrounding lands. Land filling in the eastern part of wetland area No. 4 (Figure No. 7, page 15) has resulted in loss of habitat for various songbirds, woodcock, waterfowl, and pheasants.

## ECONOMIC AND SOCIAL

There are few farms in Orange County which are considered to be economically or socially depressed. The countryside is rapidly changing into a suburb of greater New York City, with resultant losses of upland dairy farms.

In the muck area, several owners of small tracts rent their land to the 10 farm operators. These operations employ 1 1/2 or more man-years of employment annually. When flooding of the muck occurs, owners and operators experience substantial losses and hired labor is often forced to seek employment elsewhere.

# PROJECTS OF OTHER AGENCIES

There are no known water resource development project proposals by county, state, or federal agencies that will affect, or be affected by, proposed project measures.

# PROJECT FORMULATION

The watershed's Sponsoring Local Organization initiated a letter of intent to apply for P.L. 566 planning assistance, as outlined in the Office of Management and Budget Circular No. A-95, in 1969. The Sponsors filed for planning assistance under P.L. 566 in November 1969, and the application was approved by the New York State Department of Environmental Conservation, Division of Water Resources, on December 4, 1969. The Soil Conservation Service's State Conservationist requested a planning authorization, from the SCS Administrator, in September 1970; the Administrator authorized planning on October 5, 1970.

Upon receipt of planning authority, the State Conservationist advised the following agencies of the authorization and requested that they provide comments or expressions of interest concerning the project:

Palisades Interstate Park Commission
Department of Environmental Conservation, New York State
Department of Defense, Army Corps of Engineers
Department of Commerce, National Oceanic and Atmospheric Administration
Environmental Protection Agency
Department of the Interior, Bureau of Mines
New York State Soil and Water Conservation Committee
Orange County Legislature
Orange County Soil and Water Conservation District
Department of the Interior, Bureau of Sport Fisheries and Wildlife
Department of Agriculture, Forest Service
State Office of Planning Coordination
Department of the Interior, U. S. Geological Survey
Department of Agriculture, Farmers Home Administration
Department of Agriculture, Agricultural Stabilization and Conservation Service

The following are dates of local meetings, involving local citizens, Orange County Legislature, Orange County Soil and Water Conservation District, news media, and others, held on this watershed to develop objectives and alternatives and to discuss impacts:

July 31, 1969 (Preliminary Investigation Report presented)
August 26, 1971
September 2, 1971

A meeting, relative to a proposed multiple-purpose reservoir in Goosepond Mountain State Park, was held on May 27, 1970. Participants in the meeting included, the General Manager, Palisades Interstate Park Commission; the Acting Director of Planning and Research, New York State Park Commission; and the District Conservationist, Soil Conservation Service. Based on on-site observations, the group concluded that the structure would not be compatible with the Goosepond Mountain State Park recreation plan.

The planning of this watershed has been coordinated with the New York State Office of Parks and Recreation regarding historical and archeological investigations. An investigation of specific areas to be disturbed will be made by an archeologist prior to completion of the work plan. Personnel of the Bureau of Sport Fisheries and Wildlife, U. S. Department of Interior, and the New York State Department of Environmental Conservation made a reconnaissance of the project area with Soil Conservation Service personnel, to coordinate the fish and wildlife aspects of the project. The Environmental Protection Agency has provided an assessment of water quality, and advised Soil Conservation Service personnel during project formulation.

Goals and objectives of this plan are in agreement with the three major objectives -- National Income, Regional Development, and Environmental Quality -- as proposed in the North Atlantic Regional Water Resources Study, June 1972. The study was authorized by the 1965 Water Resources Planning Act (P.L. 89-80) and the 1965 Flood Control Act (P.L. 89-298), and carried out under guidelines set by the Water Resources Council. The NAR study was a Type I Comprehensive Framework Plan which furnishes a general appraisal of overall water and related land resource development needs and serves as a guide to further detailed planning within the Region.

Type IV Cooperative Surveys, have been authorized and are underway in the Eastern New York River Basin. These are state sponsored surveys of water and related land resources in which one or more federal agencies cooperate with the state or each other.

## OBJECTIVES

Specific objectives agreed to, as shown in the Sponsor's "Application for Assistance," dated November 1969, are as follows:

1. Provide an economically feasible measure of flood protection for the 440 acres of cropland at Chester.

2. Improve drainage of the muckland.

3. Provide water for irrigation, water-based recreation and low flow augmentation.

4. Provide water for fish and wildlife.

## ENVIRONMENTAL CONSIDERATIONS

Potential adverse impacts recognized in the formulation of this project and consideration given to minimize their effects include:

1. Avoidance of displacement of people or businesses was a prime consideration in the selection of structural measures.

2. Induced flood damages downstream by channel modification. Structural measures would be selected to minimize these damages.

3. Potential destruction of wildlife habitat during construction and for the life of the project. The channels and construction areas will be vegetated with desirable species of grasses and legumes which have a high value for wildlife.

4. High erosion rates will occur during construction. These rates will be minimized by following strict guidelines during construction.

5. Potential reservoirs for recreational activities would contain water of quality sufficient for swimming.

# ALTERNATIVES

Alternatives to the planned project can be divided into two categories, nonstructural and structural. Many combinations of these categories are possible, including some which are not realistic. During the evaluation of alternatives, those which proved to be unworkable, or impossible, were not explored further.

## NONSTRUCTURAL

### Land Treatment Program

This alternative would provide technical assistance to review and make needed revisions of conservation and woodland plans; to maintain existing cover, which is adequate, and install essential land treatment measures; and to plan and apply land treatment measures applicable to land areas which require treatment.

The land treatment program would apply to all of the lands in the watershed. Conservation measures would be applied on cropland, forest land, and urban land, as described under the "Works of Improvement to be Installed" section.

The cost of the land treatment program would be about $322,000. This alternative would improve the hydrologic condition of the watershed, but would not measurably reduce runoff from the 100-year frequency storm event.

The installation of vegetative and structural types of land treatment measures would effectively reduce runoff, conserve soil moisture, and prevent excessive losses of topsoil. The amount of sediment leaving the watershed would be reduced by 160 tons annually.

Land treatment measures would enable landowners to better implement sound land management plans and increase efficiencies of production, increase wildlife habitat, and improve water quality.

This alternative would not meet the selected objectives of the Sponsors. Although floodwater damages in reach 1 would be reduced, the resulting protection is not at the level desired.

## STRUCTURAL ALTERNATIVES

### Land Treatment and Stream Channel Modification

This alternative consists of land treatment and 12,600 feet of channel modification and would cost an estimated $1,020,000. The land treatment would be the same as that discussed under "Land Treatment Program." The same costs and effects would be applicable. The channel modification of Cromline Creek would begin at Craigville and extend upstream to the Erie-Lackawanna Railroad tracks, with a lateral channel extending into the Chester Muckland.

The combination of the measures in this alternative would cause the following environmental impacts:

a. An induced rise of 1.7 feet in stage from the 10-year frequency flow at Craigville.

b. Reduction of floodwater damage (control flooding up to the 10-year event) on 440 acres of developed muckland.

c. Retention of muckland in agricultural production.

d. Income will be increased to ten farm families.

e. Activities stemming from the project will create 4 man-years of employment.

f. Wildlife habitat along the channels will change from brush and trees to grass and legume.

g. Loss of six acres of developed muckland and five acres of undeveloped mineral soil land.

h. Limited short-term increases in downstream sediment rates and in air pollution will occur during construction of structural measures.

i. Short-term loss of wildlife habitat during construction.

This alternative would meet the Sponsors' objectives of providing a flood prevention program and improved drainage of the muckland. The environmental consideration, regarding induced flood damage downstream, would not be met and therefore is not acceptable to the Sponsors.

### Land Treatment, Pumping Plant, Channel Modification and Multipurpose Structure

This alternative consists of land treatment, a pumping plant located at the Lehigh and Hudson River Railroad bridge opening, modification of about 2.1 miles of channel within the Chester Muck, and a multipurpose structure (floodwater and irrigation water storage) located south of the muck area. This alternative has an estimated cost of $1,660,000 and would cause the following impacts:

a. Reduction of floodwater damage (control flooding up to the 10-year event) on 440 acres of muckland.

b. Retention of muckland in agricultural production.

c. Provide 200 acre-feet of irrigation water storage annually at a cost of $1,600 per acre-foot.

d. Income will be increased to 10 farm families.

e. Activities stemming from the project would create about 4 man-years of employment annually.

f. Wildlife habitat along the channels would change from weeds and brush to grass and legumes.

g. Loss of six acres of developed muckland and about 35 acres of undeveloped mineral soil land.

h. Limited short-term increases in downstream sediment rates and in air pollution during construction of structural measures.

i. Short-term loss of wildlife habitat during construction.

j. Construction activities will create 25 man-years of employment.

k. Loss of about 25 acres of agricultural wildlife habitat.

l. Gain of about 20 acres of open water and 5 acres of maintained grass and legume (agricultural habitat).

m. About 10 acres of existing agricultural habitat will become subject to periodic inundation.

The land treatment would be the same as that discussed under "Land Treatment Program." The same costs and effects would be applicable. This alternative would meet the Sponsors' objective of providing flood prevention, improved drainage of the muckland, and water for irrigation. However, the cost of irrigation water exceeds its value in agricultural production.

## NO PROJECT ALTERNATIVE

A final alternative is the so-called "do nothing" approach which would not make any changes in the existing environment. The watershed would essentially remain as outlined in the "Watershed Resources - Environmental Setting" section of this report. It would still be plagued with the problems which led to the initiation of this project; however, the Soil Conservation Service's on-going programs would continue. Both the adverse and favorable effects of the selected project measures would be eliminated. Erosion, sediment, and floodwater damage reductions would be foregone. Net average annual monetary benefits foregone would total $17,100.

## REASON FOR SELECTING PLANNED PROJECT

The project, as formulated, consists of a planned program of land treatment measures, a pumping plant, and 2.1 miles of channel modification. This formulation will meet Sponsors' objectives for an economically feasible means of flood protection, and improved drainage of muckland. The elimination of environmental concerns regarding displacements of people and businesses, induced flood damages, destruction of wildlife habitat, and high erosion rates during construction are satisfied by this formulation.

The Sponsors' objectives concerning water for (1) irrigation was not met due to high unit costs, (2) water-based recreation was not met due to low quality water, (3) low flow augmentation was not met as need was not demonstrated, and (4) fish and wildlife improvement was not met because of lack of identifiable local sources of financing.

# WORKS OF IMPROVEMENT TO BE INSTALLED

## LAND TREATMENT MEASURES

Adequate land treatment will be installed on 400 acres of cropland (muck), 2,920 acres of forest land, and 3,980 acres of urban land during the project installation period. (See Table 1.) Table L shows planned kinds and estimated amounts of land treatment measures to be applied.

Technical assistance will be provided to plan land use changes, install needed conservation measures, manage watershed resources, and maintain conservation measures throughout the watershed. Assistance will be given to planning and zoning boards, community leaders, and land developers in the proper use, treatment, and development of resources in the expanding urban area. General technical assistance will also be provided for environmental education and stimulation of landowners to participate in good land management practices.

Wildlife habitat management practices will be interspersed throughout the watershed, including urban developments. These practices will include planting grasses, legumes, and shrubs; constructing watering facilities; and releasing apple trees and other food plants. Technical assistance will be provided for wildlife and recreation area development on the 3,980 acres of anticipated urban development, during project installation.

Multiple-purpose management guidelines and improvement measures will be installed on approximately 2920 acres of private forest land during the installation period. Specific measures will include management plans, tree planting, controlled harvesting, skid trail and access road location and stabilization, and environmental improvement activities to improve stand vigor and benefit wildlife, recreation and aesthetic values.

TABLE L - LAND TREATMENT INSTALLATION

| Land Treatment Measures 1/ | Unit | Amount to be Applied |
|---|---|---|
| Cropland | | |
| Conservation Cropping System | Ac. | 400 |
| Cover and Green Manure Crop | Ac. | 300 |
| Subsurface Drain | Ft. | 750 |
| Drainage Field Ditch | Ft. | 65,000 |
| Drainage Main or Lateral | Ft. | 20,000 |
| Land Smoothing | Ac. | 400 |
| Forest Land | | |
| Forest Management | Ac. | 2,920 |
| Urban-Environmental Forestry | Ac. | 2,270 |
| Urban Land | | |
| Conservation Plans | No. | 6 |
| Access Road | Ft. | 22,000 |
| Critical Area Planting | Ac. | 18 |
| Debris Basin | No. | 5 |
| Dike | Ft. | 500 |
| Diversion | Ft. | 3,000 |
| Drainage Main or Lateral | Ft. | 1,500 |
| Fencing | Ft. | 4,000 |
| Fishpond Management | No. | 8 |
| Grade Stabilization Structure | No. | 4 |
| Grassed Waterway or Outlet | Ac. | 3 |
| Hedgerow Planting | Ft. | 1,200 |
| Mulching | Ac. | 20 |
| Pond | No. | 4 |
| Wildlife Watering Facility | No. | 5 |
| Land Protected During Development | Ac. | 600 |
| Structure for Water Control | No. | 3 |

1/ Definition for land treatment measures in Appendix B

## STRUCTURAL MEASURES

Planned structural measures include a pumping plant and 2.1 miles of channel modification. Design data is shown on Tables 3 and 3A. Location of these measures is shown on reach No. 1, Flood Plain Map (Appendix A). With continued maintenance and replacement, the structures should be fully effective beyond their 25-year design life.

### Pumping Plant

The pumping plant, as planned, will consist of a sump and three electrically driven propeller pumps. Each pump will have a 60 horsepower motor and be capable of pumping 20,000 gallons per minute against a total head of 10 feet. This system will discharge the one-day, 10-year frequency runoff volume in a period of 24 hours. Automatic controls will be installed to start each pump in sequence as the water rises to the level needed to operate that pump and to stop each pump as the water level recedes. A 3-phase, 220-volt power line (estimated length 2,600 feet), will be constructed to provide needed power at the pumping plant.

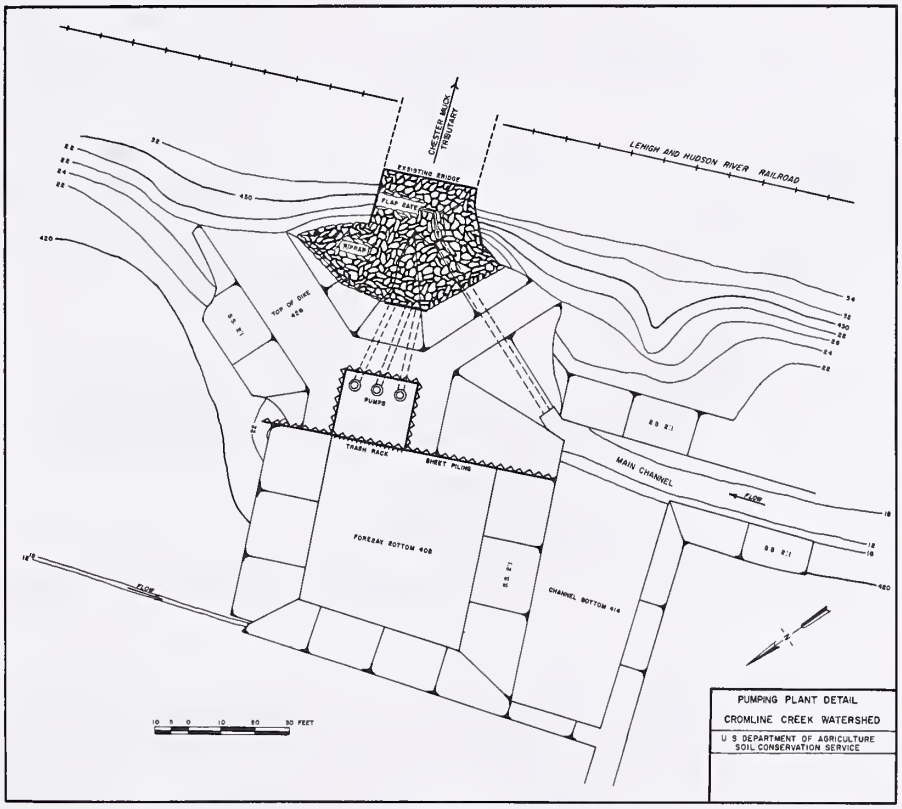


FIGURE 9 - DETAILS OF PUMPING PLANT

The 20-foot-wide by 22-foot-long by 10-foot-deep sump will consist of steel sheet piling walls and a reinforced concrete floor. H-piling, driven to rock, will support the sump at each corner. The pumps and motors will be supported on a reinforced concrete deck. A trash rack will be installed in the sump with provisions for stop logs. A metal building will cover the pumps and motors and will be constructed to allow for servicing of the pumps.

An earth dike will be installed, on the west side of the Lehigh and Hudson River railroad bridge opening, to prevent Cromline Creek backwater from entering onto the muckland. It will have 3 to one side slopes and a 10-foot top width. Volume of fill is estimated at 1,500 cubic yards. To pass the base flow, a 30-inch diameter culvert, with a flap gate on the outlet, will be installed under the dike. An all-weather road will be constructed to provide access to the pumping plant.

## Channel Modification

The 2.1 miles of channels were designed to carry the 5-year frequency peak discharge. This design capacity was selected, based on pump operations. The pumps are required to discharge the one-day, 10-year frequency run-off volume in a period of 24 hours.

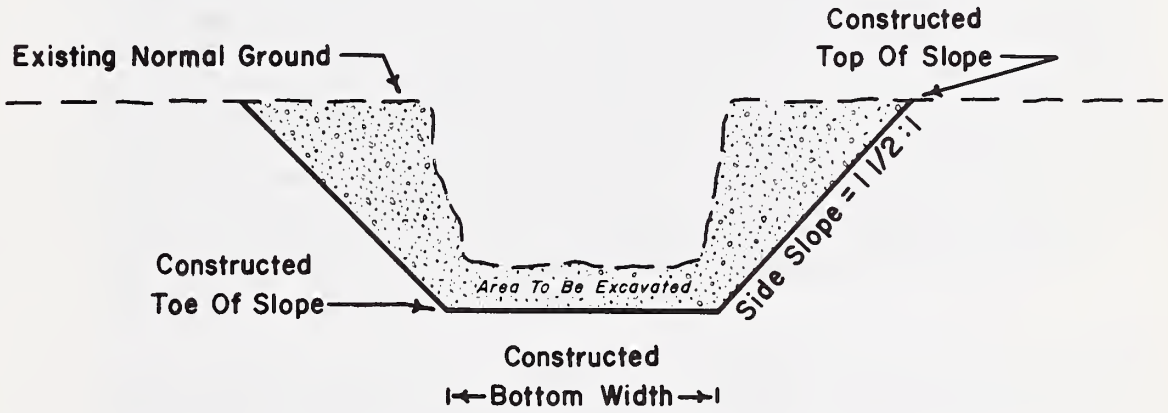


FIGURE 10 - TYPICAL CHANNEL MODIFICATION CROSS SECTION

The channels will generally be constructed through materials whose profile consists of muck and peat underlain by gray silt and gray clay. It is anticipated that a gray sand will also be encountered. It may be necessary to stabilize the sands and gray silt using either vegetative or structural means.

The existing main channel, intermittent and manmade, will be deepened and enlarged from the south end of the muck to the pumping plant, a distance of approximately 6,300 feet. The culvert under Greycourt Avenue will be replaced and the culvert under the Erie-Lackawanna Railroad will be lowered. (See Table 3.) Four farm bridges will be replaced. The Erie-Lackawanna lateral, a new channel approximately 1,870 feet long, will be constructed on the south side of, and parallel to, the Erie-Lackawanna Railroad. A new lateral (Lehigh and Hudson) is to be constructed from the pump plant northward along the Lehigh and Hudson River Railroad to the edge of the muckland, a distance of approximately 2,880 feet. Flap gates will be installed on two of the existing culverts under the railroad. The other nine culverts will be closed. A bridge will be installed over the lateral for the pumping plant access road.

Pipe drop inlets will be installed where laterals enter the constructed channels. An establishment period of 3 years will be used to ensure that the channels, as constructed, are stabilized. Minimum landrights will involve 13 acres, including 6 acres of cropped muckland and 7 acres of land used in the present channel system.

Each contract will require that contractors adhere to strict guidelines for minimizing soil erosion, water, noise, and air pollution during construction. The guidelines will include measures such as sediment basins and temporary vegetation and mulching, to protect exposed areas until permanent vegetation is established. Adherence to state and local health requirements will be required regarding disease vector control, noise, and air pollution. Suppressors will be used to keep dust within tolerable limits. Pollution of surface areas or ground water by chemicals, fuel, lubricants, sewage, and other pollutants will not be permitted. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable state and local laws.

Requirements for safety and health, in conformance with the Federal Construction Safety Act of 1969 (P.L. 91-54), will be included in each construction contract. Design and construction will comply with applicable state laws.

The watershed work plan has been coordinated with the Division of Historic Preservation, New York State Parks and Recreation. Investigations to date indicate that there may be some archeological items in the construction area. If artifacts or other items of archeological or historic significance are uncovered by SCS, or brought to its attention by others prior to or during construction, the Division of Historic Preservation and the National Park Service will be notified. Appropriate arrangements will be made for survey or salvage as needed.

# EXPLANATION OF INSTALLATION COST

The total installation cost of the works of improvement is estimated to be $647,750. Of this total, $278,100 will be paid by Public Law 566 funds and $369,650 by other funds. Total installation cost includes $383,850 for establishing land treatment measures on private land and $263,900 for structural measures. Table 1 contains further cost information.

Land treatment costs include P.L. 566 funds of $62,400 to be used by SCS and FS to provide accelerated technical assistance; regular SCS program funds of $18,000 and current cooperative federal-state forestry program funds of $4,900 for technical assistance to continue the going program; and costs of $298,550 for applying land treatment. Landowners and operators will apply land treatment with cost-sharing assistance (Table M) that may be available through local, state, or federal programs at the time of installation.

TABLE M - SCHEDULE OF OBLIGATIONS - LAND TREATMENT
1/
(Dollars)

| Year | Public Law 566 Funds | Other 2/ Funds | Total |
|---|---|---|---|
| 1 | $6,000 | $32,000 | $38,000 |
| 2 | " | " | " |
| 3 | " | " | " |
| 4 | " | " | " |
| 5 | " | " | " |
| 6 | " | " | " |
| 7 | " | " | " |
| 8 | " | " | " |
| 9 | " | " | " |
| 10 | 8,400 | 33,450 | 41,850 |
| TOTAL | $62,400 | $321,450 | $383,850 |

1/ Price Base: 1974
2/ Includes state and cooperative forest management technical assistance monies

The total installation costs of structural measures includes costs for construction, engineering services, landrights, and project administration. The cost for each major structural measure has been determined individually as shown in Table 2. The schedule of obligations for structural measures is shown on Table N.

TABLE N - SCHEDULE OF OBLIGATIONS - STRUCTURAL MEASURES

(Dollars) 1/

| Fiscal Year | Measures | Public Law 566 Funds | Other Funds | Total |
|---|---|---|---|---|
| First | Engineering Services - Pumping Plant | 18,100 | | 18,100 |
| | Landrights - Pumping Plant | | 7,300 | 7,300 |
| | Project Administration | 3,200 | | 3,200 |
| 1st Year Totals | | 21,300 | 7,300 | 28,600 |
| Second | Engineering Services - Channels | 8,400 | | 8,400 |
| | Landrights - Channels | | 18,900 | 18,900 |
| | Construction-Pumping Plant | 113,400 | | 113,400 |
| | Project Administration | 12,600 | 2,200 | 14,800 |
| 2nd Year Totals | | 134,400 | 21,100 | 155,500 |
| Third | Landrights - Channels | | 18,700 | 18,700 |
| | Construction - Channels | 52,600 | | 52,600 |
| | Project Administration | 7,400 | 1,100 | 8,500 |
| 3rd Year Totals | | 60,000 | 19,800 | 79,800 |
| GRAND TOTAL | | 215,700 | 48,200 | 263,900 |

1/ Price Base 1974

Construction costs include the estimated contract cost plus a contingency allowance of 12 percent. All costs are based on estimated quantities and current (1974) unit costs. The unit costs were obtained from actual bid prices for similar works constructed in the state and from costs submitted by material supply firms. Construction costs include such items as excavation, pumps and motors, steel sheet piling, concrete, riprap, gates, and culverts. The estimated construction cost is $113,400 for the pumping plant, $29,100 for the main channel, and $23,500 for the laterals. Construction costs will be paid by P.L. 566 funds.

Engineering services costs include the direct cost of engineers and other technicians for surveys, engineering and geologic investigations, design, and preparation of plans and specifications for structural measures, including associated vegetative work. The costs for engineering services are estimated at $26,500. These costs will be paid by P.L. 566 funds.

Relocation payments include moving and related expenses for a displaced person, business, or farm operation, as well as financial assistance for replacement housing for a displaced person who qualifies and whose dwelling is acquired because of the project. No relocations are anticipated; however, in the event they should occur, the cost-sharing of relocation payments will be based on the ratio of P.L. 566 funds and other funds, minus relocation payments, to the total project cost.

Project administration costs include the costs incurred for layout, inspection, relocation assistance advisory services (when relocation occurs), administration of contracts, and other administrative and clerical services necessary to install the project. The Sponsoring Local Organization will bear the costs it incurs to administer construction contracts and for such inspection and other administrative services, as it requires, for installation of the project. The Service will bear the costs it incurs for layout, inspection, and for such other administrative, clerical, and other services it provides. The Service may not use P.L. 566 funds to assist the Sponsors to provide relocation assistance advisory services. Project administration costs are estimated to be $26,500. The Service and the Sponsors will each bear the costs of project administration it provides, estimated to be $23,200 and $3,300 respectively.

Landrights costs are estimated to be $44,900 and include all expenditures to be made in acquiring land, replacing culverts and bridges, and constructing access roads. These costs include $3,700 for a culvert under Greycourt Road, $15,000 for six farm bridges, $6,800 for the pumping plant access road, and $19,400 for survey, legal fees, land, and other costs. Landrights costs were determined with the cooperation of the local sponsors and will be paid entirely from other funds.

# EFFECTS OF WORKS OF IMPROVEMENT

## FLOOD PREVENTION, EROSION AND SEDIMENT

Planned project measures will reduce annual flood damages in reaches 1 and 2 by 74 percent. Average annual agricultural and indirect floodwater damages will be reduced about 95 percent in reach No. 1. Project measures will not reduce or increase floodwater damages in reach No. 2. Table O illustrates project measure effects on areas inundated in reach No. 1 by selected storm frequencies.

TABLE O - FREQUENCY - AREA INUNDATED

| Reach 1/ | Storm Frequency | Without Project Area Inundated (acres) 2/ | With Project Area Inundated (acres) |
|---|---|---|---|
| Reach 1 | 100-year | 346 | 346 |
| | 10-year | 290 | 91 |
| | 5-year | 260 | 33 |
| | 2-year | 212 | 0 |

1/ See Reach No. 1 Flood Plain Map in Appendix A
2/ In addition up to 94 acres will be supersaturated

Flooding from a 10-year frequency event would be of short duration (less than 24 hours). The planned level of protection is not adequate for urban development. Limited development has occurred on the flood plain; no future development is anticipated. Floods, of the magnitude of the 1969 events, would not cause damages if planned project measures were installed.

Direct benefits of flood reduction will accrue to 10 muckland farms (440 acres). The project will allow the muckland to be more efficiently used. No new land will be brought into production. Surplus crops will not be grown on the muck. Interruption of public use of the streets and roads crossing the muck will be reduced.

Gross erosion on 200 acres of urbanizing land will be reduced from 5,600 to 4,500 tons annually. Annual quantities of sediment delivered to the mouth of the watershed from 5,200 to 5,000 tons. Sediment concentration at the mouth will be reduced from 136 to 130 milligrams per liter.

Detrimental effects on watershed aesthetics and wildlife habitat, caused by urban development, will be alleviated by planned land treatment measures.

The works of improvement will remove about 6 acres of muckland from agricultural production. Approximately 7 of the 13 acres committed to the project, are being used for the existing channel system. The discharge from the project area will create less than one-tenth foot increase in the stages of Cromline Creek and will not induce measurable damages downstream.

The planned structural measures will reduce the delivery of nutrients and toxic agricultural wastes from the watershed. Through better flood control and agricultural practices these potential pollutants will tend to remain associated with land, to be reduced into nontoxic substance or be utilized by plants.

About three acres of perennial weeds on the banks, and cattails and other emergent acquatics in the channel will be eliminated by channel modification. This vegetation will be replaced by seedings of perennial grasses and legumes and will be usable as nesting cover by songbirds and waterfowl. Muskrat activity in the channel will be temporarily disturbed during construction.

## ECONOMIC AND SOCIAL

The project will significantly increase the per capita income of the ten farm families who operate the muckland farms and will help maintain agricultural production. Additional storage and processing activities, stemming from increased vegetable production, will create about 3 man-years of employment annually.

## PROJECT BENEFITS

Estimated average annual monetary flood damages will be reduced from $34,900 to $8,900 by the proposed project. (See Table 5.) Floodwater damage reduction benefits resulting from land treatment measures are estimated to be $600 annually; however, these benefits were not used for structural measure justification.

Structure measures protecting reach No. 1 will accrue annual benefits of $25,400 from flood damage reduction. Secondary benefits (value of additional labor used in storage and processing activities) from structural measures are estimated to be $17,100. Total structural measure benefits are estimated to be $42,500. (See Table 6.) Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

## COMPARISON OF BENEFITS AND COSTS

The average annual cost of structural measures is estimated to be $25,400. These measures are expected to produce annual benefits, excluding secondary benefits, of $25,400, or $1.00 for each dollar of cost. The ratio of total average annual project benefits ($42,500) to the average annual cost of structural measures ($25,400) is 1.7 to 1.0. Table 6 shows the summary of costs and benefits.

# PROJECT INSTALLATION

The Orange County Soil and Water Conservation District will petition the Orange County Legislature to establish a small watershed protection district, in accordance with New York State's enabling legislation (Article 5-D of the County Law). Upon approval by the Legislature, the Cromline Creek Small Watershed Protection District will have legal authority and will:

1. Provide the necessary landrights for all structural measures. They may obtain landrights through condemnation, if necessary. Appraisals will be obtained as a prerequisite to securing landrights in accordance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894).

2. Administer the contracts for all structural measures. The Sponsors, at a later date, may request the Soil Conservation Service to administer contracts.

3. Provide for such construction inspection as deemed necessary to protect their interest.

4. Request the assistance of the Cooperative Extension Service, through their agents and specialists, in developing and carrying out the watershed information and education program.

5. Request the cooperation of lending agencies such as local banks, the Farmers Home Administration, the Production Credit Association, and the Federal Land Bank, to provide loans to help cooperating landowners and operators install needed treatment measures.

The Orange County Soil and Water Conservation District will be responsible for providing assistance to landowners and operators to help them plan, establish, and maintain land treatment measures. The land treatment measures will be installed at an approximate uniform rate over the 10-year installation period. Similar measures required to meet the total conservation needs will continue to be installed thereafter.

The Soil Conservation Service will:

1. Under the Orange County Soil and Water Conservation District's Memorandum of Understanding with the U. S. Department of Agriculture, provide technical assistance for planning, installing, and maintaining conservation measures.

2. Furnish engineering services for the surveys, layouts, design, and preparation of plans and specifications for the structural measures.

3. Provide for project administration services, including a government representative to administer the expenditures of federal funds, and ensure that all structural measures are installed in accordance with plans and specifications.

The Forest Service will:

Provide guidance and direction to the New York State Department of Environmental Conservation, Division of Lands and Forests, for implementation of the proposed forestry treatment.

The New York State Department of Environmental Conservation, Division of Lands and Forests will:

In cooperation with the Forest Service, furnish technical assistance to landowners and others for the determination of needed practices and installation of forest treatment measures.

# FINANCING PROJECT INSTALLATION

Federal assistance, financial and other, to be furnished by the Soil Conservation Service in carrying out the project, is contingent on the appropriation of funds for this purpose. Before federal funds are made available, the Sponsoring Local Organization will:

1. Give assurances that all necessary landrights have been secured.

2. Provide for administering the contracts.

3. Execute a project agreement.

Technical assistance funds for forestry activities will be provided through the going program of the Forest Service and the Forest Practice Act Program of the New York State Department of Environmental Conservation.

The Orange County Agricultural Stabilization and Conservation Committee will provide cost-sharing assistance to farmers, in the watershed, for installation of land treatment measures in accordance with the provisions of the program in effect at the time assistance is provided.

The Farmers Home Administration will give special consideration to eligible farm families in the way of credit and farm management guidance to establish the necessary land treatment measures and improve farm income. This assistance may vary over the years as the regulations pertaining to Farmers Home Administration loan programs are altered to meet changing conditions.

A preliminary application has been filed by the Muck Growers Association for a P.L. 566 loan, administered by the Farmers Home Administration, for the costs of the landrights and project administration. The estimated amount of this loan is $48,200. The watershed protection district will have the authority to tax landowners in proportion to benefits received. The district will use this authority to repay the loan obtained from the Farmers Home Administration.

The Orange County Legislature will provide for expenses incurred in the formation of the Small Watershed Protection District. The Cromline Creek Small Watershed Protection District will bear the landrights costs associated with the installation of the structural measures. Funds for these district establishment expenses and landrights costs will be provided through procedures prescribed in New York State's enabling legislation (County Law). Under provisions of County Law, up to 50 percent of the costs of landrights needed for flood prevention may be reimbursable through New York State funding.

# PROVISIONS FOR OPERATION AND MAINTENANCE

## LAND TREATMENT MEASURES

Land treatment measures will be operated and maintained by the landowners and operators. Technical assistance will be provided by the Orange County Soil and Water Conservation District, and the New York State Division of Lands and Forests, subject to availability of resources.

## STRUCTURAL MEASURES

Annual operation and maintenance cost for the structural measures is estimated to be $3,000, including costs for electricity for pumping plant. This cost will be borne by the Cromline Creek Small Watershed Protection District by taxing of the beneficiaries. Operation and maintenance to be performed by the district involves mowing the ditches, cleaning the trash racks, eliminating floating debris, repair of any damage to the pumping plant, and periodic replacement of deteriorated parts of the structures.

The Sponsors and the Soil Conservation Service will make a joint inspection annually, after unusually severe floods, and after the occurrence of any other unusual conditions that might adversely affect the structural measures. They will jointly determine what maintenance measures are needed. These inspections will continue for 3 years following installation of the structures. Inspection after the third year will be made annually by the Sponsors. They will prepare a report and send a copy to the Service.

An establishment period of 3 years is provided for all structural works of improvement and associated vegetative cover. During this period the Soil Conservation Service may use P.L. 566 funds to cost-share on any repairs or other work resulting from unknown conditions or deficiencies. The cost of repairs will be shared in the same ratio as for the original structure.

Repairs or additional work not eligible for P.L. 566 financial assistance include maintenance work and work resulting from improper operation and maintenance. However, the Soil Conservation Service will provide technical assistance that may be needed in performing any of these tasks.

An operation and maintenance agreement between the Soil Conservation Service and the District will be executed for each structure prior to the signing of a project agreement. An operation and maintenance plan will be prepared for each structure in accordance with guidelines outlined in the State of New York Watersheds Operation and Maintenance Handbook, published by the Soil Conservation Service.

# INVESTIGATIONS AND ANALYSES

## LAND TREATMENT

Present and future land use and land treatment needs were determined by Soil Conservation Service personnel assisting the Orange County Soil and Water Conservation District, representatives of the New York State Division of Lands and Forests, and the Forest Service.

Basic data used in developing land treatment programs included records of land treatment practices already applied by landowners in the watershed, land use trends, soil surveys, and information contained in Conservation Needs Inventory. The estimated amount of technical assistance required is based on records of time used to establish these practices in the past. Cost of establishing these practices is based on records maintained by the county office of the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, the Soil and Water Conservation District, and the Division of Lands and Forests of the New York State Department of Environmental Conservation.

Information on the hydrologic condition of the forest land in the watershed and the reasons for the present hydrologic conditions were obtained in a series of systematically located sample field plots. Information gathered on the plots included measurements of the incorporated soil organic matter, compaction of the forest floor, humus types, and the hydrologic soil grouping. From these data, precipitation-runoff curve numbers were obtained for the forest land. Disturbances such as fire, cutting, logging, grazing, and insect and disease damage were evaluated and existing forest management conditions were observed on each plot. Site characteristics, such as soil texture, soil depth, and slope were measured and the physical ability of the site to improve hydrologically was determined. From this information, forest management practices, which would maintain or improve forest resources and favorable hydrologic conditions, were determined for the watershed.

## ARCHEOLOGICAL AND HISTORICAL SURVEY

An archeological and paleontological survey is scheduled in May 1974 by the Department of Anthropology, New York State University, as recommended by the New York State Museum and Science Service. The survey will consist of a surface reconnaissance, test pits, survey of literature, evaluation of any material found, and preparation of report. If materials are found, recommendations will be made as to suitability and worthiness for salvage.

## HYDROLOGIC AND HYDRAULIC INVESTIGATIONS

Records of nonrecording rain gages at Middletown, Warwick, and West Point (all approximately 10 miles from the watershed) and of recording gages at Oakland Valley (approximately 18 miles away) and Woodland-Ardsley (about 30 miles away) were used in analyzing rainfall-frequency-duration relationships for historical storms. Additional rainfall data were obtained from Weather Bureau Paper No. 40 (TP-40), "Rainfall Frequency Atlas of the United States."

The watershed was divided into 9 subwatersheds, and the hydrologic soil cover complex curve number was computed for each subwatershed. This was based on soil type, land use, and land treatment. This curve number was used to convert direct rainfall into runoff using SCS Technical Release 16, "Rainfall Runoff Tables for Selected Runoff Curve Numbers."

The time of concentration for each subwatershed was based on channel hydraulics in the flood plain, and on the nomograph, "Hydrology: Watershed Lag (ES-1015)" in the upland areas. The stream gage data on Seely Brook were used to determine the time of concentration to New York Route 17.

Thirteen valley sections were located and surveyed to determine stage at the points of damage and to reflect the storage effects of flat topographic areas.

Cromline Creek routings were performed using procedures outlined in SCS Technical Release No. 20. Actual cross-section data were used to reflect the storage characteristics on the muck, swamp areas, and at areas of channel restriction. The one-day storm runoff peak for the 2-,5-,10-,25-, and 100-year frequency events were determined for each subwatershed and routed to establish discharge-frequency relationships through the damage area. The historical storm of May 29, 1968 was used to check routing parameters.

The discharge-frequency curves were modified to show the effects of the alternative structural measures on reducing peaks at reaches 1 and 2. Cross-sections were also modified to show reduced storage areas where such reductions were apparent by the installation of structural measures.

## ENGINEERING

The surveys made included channel cross-sections every 500 feet on the main channel upstream of the pump plant location, and a topography map of the muckland area. Semi-controlled aerial photographs were used for horizontal control for the channel survey and for a topography map. The topo map was made at a scale of 1" = 400' with 1 foot contours. A detail map covering the the pumping plant location was prepared at a scale of 1" = 20'.

The sump was designed using standard procedures for steel sheet piling. The floors will be fixed structurally to the walls to make a rigid box. The designed sump will be supported at each corner by H-piles. The pumps and motors will be supported by the top floor in the sump structure. Sump dimensions were taken from information supplied by pump manufacturers.

Channel stability, designs, and associated parameters were determined using, Technical Release No. 25 - Planning and Design of Open Channels (SCS).

## GEOLOGY

Geologic investigations were conducted for the proposed pump plant and channels. Equipment utilized in the investigations included a drill rig, portable refraction seismograph, electrical resistivity apparatus, and manual hand sampling tools. All findings were tabulated and compared with existing geologic reports, wells in the area, visual observations made in the field, and other data available. Plans and reports were made for each investigation.

The investigation of the proposed channels was conducted in April 1971. Holes were drilled along the entire southern edge of the muckland.

Ground water data were collected from Ground Water Basic Data, Orange and Ulster Counties, New York State Water Resources Commission, Bulletin 65, as well as interviews with the town clerk and several homeowners and growers along the muckland. Ground water on the muck itself has not been thoroughly investigated.

The detailed geologic investigation of the pump plant site was conducted in the months of April and August 1971. In April, the investigation consisted of drilling 4 holes to a depth of 30-35 feet and obtaining undisturbed samples of the material in the foundation. In August, one hole was drilled down to bedrock in order to establish the depth of an unyielding foundation. Standard drilling procedures were followed.

Representative soil samples were tested in the Soil Conservation Service laboratories in both Syracuse, New York, and Lincoln, Nebraska, in accordance with testing procedures outlined by American Society of Testing Materials.

Sheet erosion values were calculated using the Modified Musgrave Soil Loss Equation and procedures outlined in the Watershed Planning Guide and the SCS Technical Release No. 12. All of the basic data was obtained from soils maps, aerial photographs, and actual field measurements.

## ECONOMICS

Crop yield and flood damage data were obtained by interviews of muck farm operators. The cropping pattern on the muckland is well established and allows a composite acre computation based on onions and double-cropped lettuce. Adjustment was made for recurring floodings.

The frequency method described in the Economics Guide of the Soil Conservation Service was used in computing the floodwater damage and damage reduction benefits. Data for acres flooded for each operator were prepared by stages. Damage frequency was plotted to the 100-year level for "without project" and "with project" conditions. The difference between these conditions is considered the average annual floodwater damage reduction benefits. Indirect flood damages and benefits were estimated to be 10 percent of direct flood damage and benefits. Secondary benefits were based on estimated storage and market costs of onions and lettuce resulting from increased production. It is estimated that 20 percent of these added costs are labor costs.

An analysis of the water from Seely Brook was made by the State Health Department to determine its suitability for water contact sports.

## FISH AND WILDLIFE

The fish and wildlife aspects of the watershed were evaluated by a joint interagency field reconnaissance. Participants included biologists representing the U.S. Fish & Wildlife Service, New York State Department of Environmental Conservation, and the Soil Conservation Service.

Fishery data on lakes and streams was provided by the New York State Department of Environmental Conservation.

Physical data on wetlands and streams was collected by an SCS biologist.

Wildlife population estimates were obtained from the New York State Department of Environmental Conservation and tabulated by an SCS biologist.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Cromline Creek Watershed, New York

| Installation Cost Item | Unit | Number | ESTIMATED COST (Dollars) | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | Public Law 566 Funds | | | Other Funds | | | |
| | | | SCS 3/ | FS 3/ | Total | SCS 3/ | FS 3/ | Total | |
| LAND TREATMENT | | | | | | | | | |
| Land Areas 2/ | | | | | | | | | |
| Cropland | Acres | 400 | | | | 36,700 | | 36,700 | 36,700 |
| Forest Land | Acres | 2,920 | | | | | 31,000 | 31,000 | 31,000 |
| Urban and Built-up | Acres | 3,980 | | | | 210,850 | 20,000 | 230,850 | 230,850 |
| Technical Assistance | | | 43,600 | 18,800 | 62,400 | 18,000 | 4,900 | 22,900 | 85,300 |
| TOTAL LAND TREATMENT | | | 43,600 | 18,800 | 62,400 | 265,550 | 55,900 | 321,450 | 383,850 |
| STRUCTURAL MEASURES | | | | | | | | | |
| Construction | | | | | | | | | |
| Pumping Plant | No. | 1 | 113,400 | | 113,400 | | | | 113,400 |
| Channel Modification 4/ | | | | | | | | | |
| (M) Main | Miles | 1.2 | 29,100 | | 29,100 | | | | 29,100 |
| (0) Laterals | Miles | .9 | 23,500 | | 23,500 | | | | 23,500 |
| Subtotal - Construction | | | 166,000 | | 166,000 | | | | 166,000 |
| Engineering Services | | | 26,500 | | 26,500 | | | | 26,500 |
| Relocation Payments | | | | | | | | | |
| Project Administration | | | | | | | | | |
| Construction Inspection | | | 11,600 | | 11,600 | 1,300 | | 1,300 | 12,900 |
| Other | | | 11,600 | | 11,600 | 2,000 | | 2,000 | 13,600 |
| Relocation Assistance Advisory Services | | | | | | | | | |
| Subtotal - Administration | | | 23,200 | | 23,200 | 3,300 | | 3,300 | 26,500 |
| Other Costs | | | | | | | | | |
| Land Rights | | | | | | 44,900 | | 44,900 | 44,900 |
| Water Rights | | | | | | | | | |
| Subtotal - Other | | | | | | 44,900 | | 44,900 | 44,900 |
| TOTAL STRUCTURAL MEASURES | | | 215,700 | | 215,700 | 48,200 | | 48,200 | 263,900 |
| TOTAL PROJECT | | | 259,300 | 18,800 | 278,100 | 313,750 | 55,900 | 369,650 | 647,750 |

1/ Price Base 1974.

2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas not just to adequately treated areas.

3/ Federal agency responsible for assisting in installation of works of improvement.

4/ Type of channel prior to project: (N) - an unmodified, as well defined natural channel or streams; (M) - manmade ditch or previously modified channel; (0) - none or practically no defined channel.

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Cromline Creek Watershed, New York

| Measures | Unit | Applied 1/ to Date | Total Cost 2/ (Dollars) |
|---|---|---|---|
| LAND TREATMENT | | | |
| Soil Conservation Service | | | |
| Drainage Field Ditch | Feet | 19,000 | 950 |
| Conservation Cropping System | Acres | 30 | 240 |
| Forest Service | | | |
| Management Plans | No. | 1 | 165 |
| Tree Planting | Acres | 14 | 960 |
| Disease Protection | Acres | 10,000 | 11,875 |
| TOTAL | | | 14,190 |

1/ Accomplishments 1961-1970
2/ Price base: 1974

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## TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Cromline Creek Watershed, New York

(Dollars) 1/

| Item | Installation Cost - P.L. 566 Funds | | | Installation Cost Other Funds | | Total Installation Cost |
|---|---|---|---|---|---|---|
| | Construction | Engineering | Total P.L.566 | Land Rights | Total Other | |
| Pumping Plant | 113,400 | 18,100 | 131,500 | 7,300 2/ | 7,300 | 138,800 |
| Channel Modification | | | | | | |
| (M) Main | 29,100 | 4,600 | 33,700 | 26,500 3/ | 26,500 | 60,200 |
| (O) Laterals | 23,500 | 3,800 | 27,300 | 11,100 4/ | 11,100 | 38,400 |
| Subtotal | 166,000 | 26,500 | 192,500 | 44,900 | 44,900 | 237,400 |
| Project Administration | : : : | : : : | 23,200 | : : : | 3,300 | 26,500 |
| GRAND TOTAL | 166,000 | 26,500 | 215,700 | 44,900 | 48,200 | 263,900 |

1/ Price Base: 1974
2/ Includes $6,800 for access road
3/ Includes $3,700 for culvert under Greycourt Road and $12,000 for 5 farm bridges, $4,000 for survey, legal fees, and other cost
4/ Includes $3,000 for a farm bridge and $1,000 for survey, legal fees, and other cost

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TABLE 3 - STRUCTURE DATA

CHANNELS

Cromline Creek Watershed, New York

| Channel | Station | Drainage Area Sq.Mi. | Capacity cfs Reqd. | Capacity cfs Design | Water Surface Elev. | Hydraulic Gradient (ft./ft.) | Channel Dimensions Bottom (ft) | Channel Dimensions Depth (ft) | Channel Dimensions Side Slopes | "n" Value Aged | "n" Value As Built | Velocities Aged | Velocities As Built | Excavation Cu.Yds. | Type of 1/ Work | Type of 2/ Channel | Flow Cond. Prior to 3/ Project |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Channel | 96+55 | 1.75 | | | 419.0 | | | | | | | | | | | | |
| | | | 158 | 158 | | 0.0004 | 10.0 | 5.0 | 1.5:1 | 0.035 | 0.025 | 1.81 | 2.32 | 6,000 | II | M | I |
| | 69+55 | 1.29 | | | 420.1 | | | | | | | | | | | | |
| | | | 123 | 123 | 53" x 83" Elliptical Concrete Pipe Culvert Under Railroad | | | | | | | | | | | | |
| | 69+15 | 1.29 | | | 420.6 | | | | | | | | | | | | |
| | | | 66 | 66 | | 0.0003 | 6.0 | 4.1 | 1.5:1 | 0.035 | 0.025 | 1.32 | 1.72 | 1,300 | II | M | I |
| | 65+05 | 1.29 | | | 420.7 | | | | | | | | | | | | |
| | | | 66 | 66 | 48" Diameter CMP Culvert under Greycourt Avenue | | | | | | | | | | | | |
| | 64+55 | 1.29 | | | 421.7 | | | | | | | | | | | | |
| | | | 66 | 67 | | 0.0025 | 6.0 | 2.4 | 1.5:1 | 0.035 | 0.025 | 2.86 | 3.65 | 3,200 | II | M | I |
| | 49+50 | 0.90 | | | 425.5 | | | | | | | | | | | | |
| | | | 66 | 66 | | 0.006 | 6.0 | 1.9 | 1.5:1 | 0.035 | 0.025 | 3.93 | 5.02 | 1,600 | II | M | I |
| | 33+55 | 0.81 | | | 435.1 | | | | | | | | | | | | |
| Lehigh & Hudson Lateral | 0+00 | 0.41 | 75 | 81 | 419.0 | | | | | | | | | | | | |
| | | | | | | 0.0005 | 6.0 | 4.0 | 1.5:1 | 0.035 | 0.025 | 1.68 | 2.16 | 6,200 | I | O | E |
| | 28+80 | | 75 | 81 | 420.4 | | | | | | | | | | | | |
| Erie Lackawanna Lateral | 0+00 | 0.46 | | | 420.6 | | | | | | | | | | | | |
| | | | 89 | 91 | | 0.0002 | 6.0 | 5.3 | 1.5:1 | 0.035 | 0.025 | 1.23 | 1.59 | 6,100 | I | O | E |
| | 18+70 | | | | 421.0 | | | | | | | | | | | | |

1/ Type of work
- 1 - Establishment of new channel including necessary stabilization measures.
- 11 - Enlargement of existing channel or stream.
- 111 - Cleaning out natural or manmade channel.
- 1V - Cleaning and removal of loose debris within the channel sections.
- V - Stabilization as primary purpose of channel modification.

2/ Type of channel prior to project
- N - Unmodified, well defined natural channel or stream.
- M ( ) - Manmade or previously modified.
- O - None or practically no defined channel.

3/ Flow conditions prior to project
- Pr - Perennial or continuous flow except in extreme drought.
- I - Intermittent flow is continuous in some seasons and little or no flow during other seasons.
- E - Ephemeral - flow only during periods of surface runoff.

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TABLE 3A - STRUCTURAL DATA

PUMPING PLANT

Cromline Creek Watershed, New York

| Watershed Area | Pumps | | | Motor Type | Concrete | Steel Sheet Piling |
|---|---|---|---|---|---|---|
| | Capacity | Size and Type | Static Lift | | | |
| (Sq.Mi.) | (gpm) | | (ft.) | | (Cu.Yds.) | (Sq.Ft.) |
| 2.0 | 60,000 1/ | 36 In. Prop. | 3-8 | Elec. | 40.7 | 3,230 |

1/ Three pumps each 20,000 gpm

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TABLE 4 - ANNUAL COST

Cromline Creek Watershed, New York

(Dollars) 1/

| Evaluation Unit | Amortization of 2/ Installation Costs | Operation and Maintenance Cost | Total |
|---|---|---|---|
| Pumping Plant & Channels | 20,150 | 3,000 | 23,150 |
| Project Administration | 2,250 | : : : | 2,250 |
| GRAND TOTAL | 22,400 | 3,000 | 25,400 |

1/ Price base: 1974 O&M adjusted normalized
2/ Twenty-five years at 6-7/8 percent interest

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Cromline Creek Watershed, New York

(Dollars) 1/

| Item | Estimated Average Annual Damage | | Damage Reduction Benefits |
|---|---|---|---|
| | Without Project | With Project | |
| Floodwater Agricultural, Crop and Pasture | 31,600 | 8,000 | 23,600 |
| Indirect | 3,300 | 900 | 2,400 |
| TOTAL | 34,900 | 8,900 | 26,000 2/ |

1/ Price base: Adjusted Normalized Prices
2/ Includes Land Treatment

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Cromline Creek Watershed, New York

(Dollars) 1/

| Evaluation Unit | AVERAGE ANNUAL BENEFITS 2/ | | | Average 3/ Annual Cost | Benefit Cost Ratio |
|---|---|---|---|---|---|
| | Damage Reduction | Seconday | Total | | |
| Pumping Plant & Channels | 25,400 | 17,100 | 42,500 | 23,150 | 1.8:1.0 |
| Project Administration | : : : | : : : | : : : | 2,250 | : : : |
| GRAND TOTAL | 25,400 | 17,100 | 42,500 | 25,400 | 1.7:1.0 |

1/ Adjusted normalized prices

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $600 annually

3/ From Table 4

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# APPENDIX A

41°17'


41°17′30″

LEGEND

- Dual highway
- Good motor road
- Railroad
- Power transmission line
- Streams
- Marsh
- Township lines
- State park boundary
- Watershed boundary
- Area benefited
- 1 — Damage reach

PROJECT MEASURES

- Stream channel improvement for flood prevention
- ⊠ Pump plant

41°20′00″ 41°22′30″ 74°15′00″

Chester
MEADOW AVE
LEHIGH AND HUDSON RIVER
Craigville
CROMLINE CREEK
ERIE
LACKAWANNA
Camp La Guardia
BLOOMING GROVE
ROAD 2
GOOSE POND MOUNTAIN STATE PARK
CHESTER
Seely Brook
Young's Brook
OXFORD
Oxford
LARGE KING TRACK ROAD
Walton Park
CROMWELL HILL RD
Walton Lake
WARWICK
LAKE TROUT ROAD
MONROE
TUXEDO

74°15′00″ SOURCE: USGS topo sheets 41°17′30″ 41°20′00″ October 1972

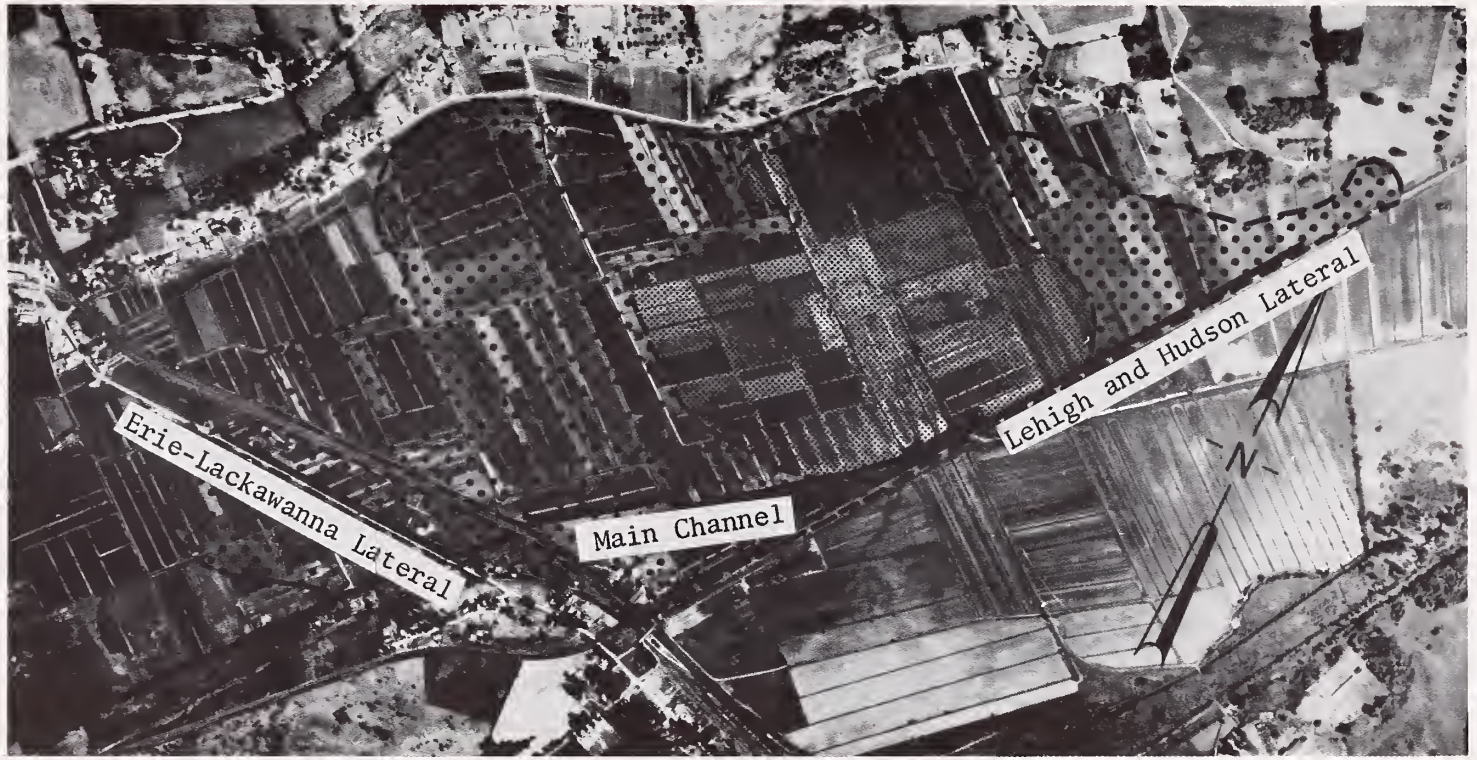
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

# PROJECT MAP
# CROMLINE CREEK WATERSHED
## ORANGE COUNTY, NEW YORK

Scale 1:42 240

1 ½ 0 1 Mile

USDA-SCS-HYATTSVILLE, MD 1974




Area inundated by 10-year flood without project

Area inundated by 10-year flood with project

Channel modification

Pumping plant

REACH NO. 1 - FLOOD PLAIN MAP

# APPENDIX B

# DEFINITION OF LAND TREATMENT MEASURES

Conservation Cropping System: Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

Subsurface Drain: A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.

Drainage Field Ditch: A graded ditch for collecting excess water within a field. This does not include Drainage Main or Lateral, or Grassed Waterway or Outlet.

Drainage Main or Lateral: An open drainage ditch constructed to a designed size and grade. Does not include Drainage Field Ditch.

Land Smoothing: Removing irregularities on the land surface by use of special equipment. Ordinarily this does not require a complete grid survey. This includes operations ordinarily classed as rough grading. This does not include the "floating" done as a regular maintenance practice on irrigated land or the "planing" done as the final step in Irrigation Land Leveling or Drainage Land Grading.

Access Road: A road constructed as a part of a conservation plan to provide needed access.

Critical Area Planting: Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critical areas. (Does not include tree planting mainly for wood products.)

Debris Basin: A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Dike: An embankment constructed of earth or other suitable materials to protect land against overflow from streams, lakes, and tidal influences; flat land areas from diffused surface waters; and to provide or improve wetland habitat for wildlife.

Diversion: A channel with a supporting ridge on the lower side constructed across the slope.

Fencing: Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, big game, or people. (Does not include electric or other temporary fences.)

Fishpond Management: Developing or improving impounded water to produce fish for domestic use or recreation.

Grade Stabilization Structure: A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include structures used in drainage and irrigation systems primarily for water control.)

Grassed Waterway or Outlet: A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversion, terrace, or other structure.

Hedgerow Planting: Establishing a hedgerow or living fence of shrubs or trees within, across, or around a field.

Mulching: Applying plant residues or other suitable materials not produced on the site to the soil surface.

Pond: A water impoundment made by constructing a dam or embankment, or by excavating a pit or "dugout."

Wildlife Watering Facility: Constructing, improving, or modifying watering facilities for wildlife.

Land Protected During Development: Treatment, based on a plan to control erosion and sediment during development for residential, commercial-industrial, community services, transportation routes or utility uses.

Includes timely installation of a single or a combination of temporary or permanent, vegetative or mechanical conservation measures. These measures include diversion dikes, interceptor berms, level spreaders, sediment basins and critical area protection, etc.

Structures For Water Control: A structure in an irrigation, drainage, or other water management system that conveys water, controls the direction or rate of flow, or maintains a desired water surface elevation. These structures are also for the protection of fish and wildlife and other environmental values, as well as for protection and management of soils and plants. (Does not include structures for which the primary purpose is to control head cutting and control erosion.)

Cover and Green Manure Crop: A crop of close-growing grasses, legumes, or small grain used primarily for seasonal protection and soil improvement. It usually is grown for one year or less, except where there is permanent cover as in orchards.

# WILDLIFE SPECIES FOUND IN THE WATERSHED REGION

## Amphibians

| Common Name | Scientific Name |
|---|---|
| Jefferson Salamander | Ambystoma jeffersonianum Green |
| Spotted Salamander | Ambystoma maculatum Shaw |
| Marbled Salamander | Ambystoma opacum Gravenhorst |
| Red-spotted Newt - Red Eft | Diemictylus viridescens viridescens |
| Northern Dusky Salamander | Desmognathus fuscus fuscus Rafinesque |
| Red-backed Salamander -) | |
| Lead-backed Salamander-) | Plethodon cinereus cinereus Green |
| Slimy Salamander | Plethodon glutinosus glutinosus Green |
| Four-toed Salamander | Hemidactylium scutatum Schlegel |
| Northern Red Salamander | Pseudotriton ruber ruber Sonnini |
| Northern Two-lined Salamander | Eurycea bislineata bislineata |
| Eastern Spadefoot | Scaphiopus holbrooki holbrooki Harlan |
| American Toad | Bufo terrestris americanus Holbrook |
| Fowler's Toad | Bufo woodhousei fowleri Hinckley |
| Northern Cricket Frog | Acris gryllus crepitans Baird |
| Northern Spring Peeper | Hyla crucifer crucifer Wied |
| Eastern Gray Tree Frog | Hyla versicolor versicolor Le Conte |
| Bullfrog | Rana catesbeiana Shaw |
| Green Frog | Rana clamitans Latreille |
| Eastern Wood Frog | Rana sylvatica sylvatica Le Conte |
| Pickerel Frog | Rana palustris Le Conte |

## Reptiles

| | |
|---|---|
| Common Snapping Turtle | Chelydra serpentina serpentina |
| Stinkpot | Sternotherus odoratus Latreille |
| Eastern Mud Turtle | Kinosternon subrubrum subrubrum Lacepede |
| Spotted Turtle | Clemmys guttata Schneider |
| Wood Turtle | Clemmys insculpta Le Conte |
| Eastern Box Turtle | Terrapene carolina carolina Linnaeus |
| Eastern Painted Turtle | Chrysemys picta picta Schneider |
| Five-lined Skink | Eumeces faciatus Linnaeus |
| Northern Water Snake | Natrix sipedon sipedon Linnaeus |
| Northern Brown Snake | Storeria dekayi dekayi Holbrook |
| Red-bellied Snake | Storeria occipitomaculata occipitomaculata |
| Eastern Ribbon Snake | Thamnophis sauritus sauritus Linnaeus |
| Eastern Garter Snake | Thamnophis sirtalis sirtalis Linnaeus |
| Eastern Hog-nose Snake | Heterodon platyrhinos platyrhinos |
| Northern Ring-necked Snake | Diadophis punctatus edwardsi |
| Eastern Worm Snake | Carphophis amoenus amoenus Say |

Wildlife Species Found in the Watershed Region cont'd

Reptiles cont'd

| Common Name | Scientific Name |
|---|---|
| Northern Black Racer | Coluber constrictor constrictor |
| Eastern Smooth Green Snake | Opheodrys vernalis vernalis |
| Black Rat Snake | Elaphe obsoleta obsoleta Say |
| Eastern Milk Snake | Lampropeltis doliata triangulum Lacepede |
| Northern Copperhead | Ancistrodon contortrix mokeson Daudin |

Birds

| | |
|---|---|
| Common Loon | Gavia immer |
| Horned Grebe | Podiceps auritus |
| Pied-billed Grebe | Podilymbus podiceps |
| Great Blue Heron | Ardea herodias |
| Eastern Green Heron | Butorides virescens |
| Great Egret | Casmerodius albus |
| Least Bittern | Ixobrychus exilis |
| American Bittern | Botaurus lentiginosus |
| Canada Goose | Branta canadensis |
| Brant | Branta bernicla |
| Mallard | Anas platyrhynchos |
| Black Duck | Anas rubripes |
| Green-winged Teal | Anas carolinensis |
| Wood Duck | Aix sponsa |
| Ring-necked Duck | Aythya collaris |
| Common Goldeneye | Bucephala clangula |
| Bufflehead | Bucephala albeola |
| Hooded Merganser | Lophodytes cucullatus |
| Common Merganser | Mergus merganser |
| Turkey Vulture | Cathartes aura |
| Sharp-shinned Hawk | Accipiter striatus |
| Cooper's Hawk | Accipiter cooperii |
| Red-tailed Hawk | Buteo jamaicensis |
| Red-shouldered Hawk | Buteo lineatus |
| Broad-winged Hawk | Buteo platypterus |
| Marsh Hawk | Circus cyaneus |
| Pigeon Hawk | Falco columbarius |
| Sparrow Hawk | Falco sparverius |
| Ruffed Grouse | Bonasa umbellus |
| Ring-necked Pheasant | Phasianus colchicus |
| Virginia Rail | Rallus limicola |
| American Coot | Fulica americana |
| Killdeer | Charadrias vociferus |

Wildlife Species Found in the Watershed Region cont'd

Birds cont'd

| Common Name | Scientific Name |
|---|---|
| American Woodcock | Philohela minor |
| Spotted Sandpiper | Actitis macularia |
| Greater Yellowlegs | Totanus melanoleucus |
| Great Black-backed Gull | Larus marinus |
| Herring Gull | Larus argentatus |
| Ring-billed Gull | Larus delawarensis |
| Laughing Gull | Larus atricilla |
| Mourning Dove | Zenaidura macroura |
| Yellow-billed Cuckoo | Coccyzus americanus |
| Black-billed Cuckoo | Coccyzus erythropthalmus |
| Screech Owl | Otus asio |
| Great Horned Owl | Bubo virginianus |
| Barred Owl | Strix varia |
| Whip-poor-will | Caprimulgus vociferus |
| Common Nighthawk | Chordeiles minor |
| Chimney Swift | Chaetura pelagica |
| Ruby-throated Hummingbird | Archilochus colubris |
| Belted Kingfisher | Megaceryle alcyon |
| Yellow-shafted Flicker | Colaptes auratus |
| Pileated Woodpecker | Dryocopus pileatus |
| Yellow-bellied Sapsucker | Sphyrapicus varius |
| Hairy Woodpecker | Dendrocopos villosus |
| Downy Woodpecker | Dendrocopos pubescens |
| Eastern Kingbird | Tyrannus tyrannus |
| Great Crested Flycatcher | Myiarchus crinitus |
| Eastern Phoebe | Sayornis phoebe |
| Least Flycatcher | Empidonax minimus |
| Eastern Wood Pewee | Contopus virens |
| Tree Swallow | Iridoprocne bicolor |
| Bank Swallow | Riparia riparia |
| Rough-winged Swallow | Stelgidopteryx ruficollis |
| Barn Swallow | Hirundo rustica |
| Northern Cliff Swallow | Petrochelidon pyrrhonota |
| Blue Jay | Cyanocitta cristata |
| Common Crow | Corvus brachyrhynchos |
| Black-capped Chickadee | Parus atricapillus |
| Tufted Titmouse | Parus bicolor |
| White-breasted Nuthatch | Sitta carolinensis |
| Red-breasted Nuthatch | Sitta canadensis |
| Brown Creeper | Certhia familiaris |
| House Wren | Troglodytes aedon |
| Winter Wren | Troglodytes troglodytes |

Wildlife Species Found in the Watershed Region cont'd

Birds cont'd

| Common Name | Scientific Name |
|---|---|
| Carolina Wren | Thryothorus ludovicianus |
| Long-billed Marsh Wren | Telmatodytes palustris |
| Catbird | Dumetella carolinensis |
| Brown Thrasher | Toxostoma rufum |
| Robin | Turdus migratorius |
| Wood Thrush | Hylocichla mustelina |
| Hermit Thrush | Hylocichla guttata |
| Swainson's Thrush | Hylocichla ustulata |
| Veery | Hylocichla fuscescens |
| Eastern Bluebird | Sialia sialis |
| Golden-crowned Kinglet | Regulus satrapa |
| Ruby-crowned Kinglet | Regulus calendula |
| Cedar Waxwing | Bombycilla cedrorum |
| Starling | Sturnus vulgaris |
| Yellow-throated Vireo | Vireo falvifrons |
| Solitary Vireo | Vireo solitarius |
| Red-eyed Vireo | Vireo olivaceus |
| Black and White Warbler | Mniotilta varia |
| Worm-eating Warbler | Helmitheros vermivorus |
| Golden-winged Warbler | Vermivora chrysoptera |
| Blue-winged Warbler | Vermivora pinus |
| Tennessee Warbler | Vermivora peregrina |
| Nashville Warbler | Vermivora ruficapilla |
| Parula Warbler | Parula americana |
| Yellow Warbler | Dendroica petechia |
| Magnolia Warbler | Dendroica magnolia |
| Cape May Warbler | Dendroica tigrina |
| Black-throated Blue Warbler | Dendroica caerulescens |
| Myrtle Warbler | Dendroica coronata |
| Black-throated Green Warbler | Dendroica virens |
| Blackburnian Warbler | Dendroica fusca |
| Chestnut-sided Warbler | Dendroica pensylvanica |
| Bay-breasted Warbler | Dendroica castanea |
| Blackpoll Warbler | Dendroica striata |
| Prairie Warbler | Dendroica discolor |
| Palm Warbler | Dendroica palmarum |
| Ovenbird | Seiurus aurocapillus |
| Northern Waterthrush | Seiurus noveboracensis |
| Louisiana Waterthrush | Seiurus motacilla |
| Yellowthroat | Geothlypis trichas |
| Hooded Warbler | Wilsonia citrina |
| Wilson's Warbler | Wilsonia pusilla |

Wildlife Species Found in the Watershed Region cont'd

Birds cont'd

| Common Name | Scientific Name |
|---|---|
| Canada Warbler | Wilsonia canadensis |
| American Redstart | Setophaga ruticilla |
| House Sparrow | Passer domesticus |
| Eastern Meadowlark | Sturnella magna |
| Redwinged Blackbird | Agelaius phoeniceus |
| Baltimore Oriole | Icterus galbula |
| Rusty Blackbird | Euphagus carolinus |
| Common Grackle | Quiscalus quiscula |
| Brown-headed Cowbird | Molothrus ater |
| Scarlet Tanager | Piranga olivacea |
| Cardinal | Richmondena cardinalis |
| Rose-breasted Grosbeak | Pheucticus ludovidianus |
| Indigo Bunting | Passerina cyanea |
| Purple Finch | Carpodacus purpureus |
| American Goldfinch | Spinus tristis |
| Rufous-sided Towhee | Pipilo erythrophthalmus |
| Savannah Sparrow | Passerculus sandwichensis |
| Slate-colored Junco | Junco hyemalis |
| Tree Sparrow | Spizella arborea |
| Chipping Sparrow | Spizella passerina |
| Field Sparrow | Spizella pusilla |
| White-crowned Sparrow | Zonotrichia leucophrys |
| White-throated Sparrow | Zonotrichia albicollis |
| Fox Sparrow | Passerella iliaca |
| Swamp Sparrow | Melospiza georgiana |
| Song Sparrow | Melospiza melodia |

Mammals

| | |
|---|---|
| Masked Shrew | Sorex cinereus cinereus Kerr |
| Smoky Shrew | Sorex fumeus fumeus Miller |
| Short-tailed Shrew | Blarina brevicauda talpoides |
| Common Mole | Scalopus aquaticus |
| Star-nosed Mole | Condylura cristata cristata |
| Little Brown Bat | Myotis lucifugus |
| Eastern Long-eared Brown Bat | Myotis keenii septentrionalis |
| Pipistrelle | Pipistrellus subflavus obscurus |
| Big Brown Bat | Eptesicus fuscus fuscus |
| Red Bat | Lasiurus borealis borealis |
| Hoary Bat | Lasiuris cinereus cinereus |
| Fisher's Chipmunk | Tamias striatus fisheri Howell |
| Southern Red Squirrel | Tamiasciurus hudsonicus loquaz |

Wildlife Species Found in the Watershed Region cont'd

Mammals cont'd

| Common Name | Scientific Name |
|---|---|
| Small Eastern Flying Squirrel | Glaucomys volans volans |
| Northern White-footed Mouse | Peromyscus leucopus noveboracensis |
| Allegheny Wood Rat | Neotoma magister Baird |
| Gapper's Red-backed Mouse | Clethrionomys gapperi gapperi |
| Meadow Mouse | Microtus pennsylvanicus pennsylvanicus |
| Norway Rat | Rattus norvegicus |
| House Mouse | Mus musculus domesticus Rutty |
| Meadow Jumping Mouse | Zapus hudsonius hudsonius |
| Woodland Jumping Mouse | Napaeozapus insignis insignis |
| Canada Porcupine | Erethizon dorsatum dorsatum |
| Bonaparte's Weasel | Mustela erminea cicognanii Bonaparte |
| New York Weasel | Mustela frenata noveboracensis (Emmons) |
| Eastern Skunk | Mephitis mephitis nigra (Peale & Beauvois) |

WATER QUALITY ANALYSIS
LAB ID # 162058 RECORD # 28095

SAMPLE LOCATION: (IRRIGATION DITCH), CROMLINE CK., CHESTER, N. Y.

STATION ID: 00162058

DATE OF COLLECTION: BEGIN -- 740605

COMMENTS: All units are in micrograms/kilogram

| | DETR. DELETED |
|---|---|
| ALDRIN | 170 |
| CHLORDANE | 250 |
| DDD | 63 |
| DDE | 130 |
| DDT | 4.8 |
| DIAZINON | 61 |
| DIELDRIN | 25 |
| ENDRIN | 7.7 |
| ETH PARTH | 0.0 |
| ETH TRITH | 7.5 |
| ETHION | 0.0 |
| HEPT EPOX | 0.0 |
| HEPTACHLOR | 0.0 |
| LINDANE | 0.0 |
| MALATHION | 0.0 |
| MET PARTH | 0.0 |
| MET TRITH | 26.0 |
| PCB | 0.0 |
| PCN | 0.0 |
| SILVEX | 0.0 |
| TOXAPHENE | 0.0 |
| 2,4-D | 0.0 |
| 2,4,5-T | |

# APPENDIX C

# REPORT OF AN ARCHAEOLOGICAL RECONNAISSANCE IN THE CROMLINE CREEK FLOOD CONTROL AREA, CHESTER, ORANGE COUNTY, NEW YORK

Bert Salwen

The work described in this report was undertaken in accordance with U.S. Department of Agriculture, Soil Conservation Service Purchase Order 676-NY-SCS-74, which called for an archaeological and paleontological survey of Cromline Creek channel and pump plant, near Chester, New York.

This was basically a reconnaissance level inventory, designed to locate any archaeological, historical, or paleontological resources that would be affected by the proposed flood control work. It involved three sets of activities: (1) a survey of the pertinent archaeological and paleontological literature and site files, (2) interviews with local farmers and with individuals fimiliar with the archaeology of the locality, and (3) an on-site survey of the terrain to be modified by the project.

## I. Bibliographic Survey.

The Cromline Creek project is located in the so-called "black dirt" region of Orange County, which, shortly after the retreat of the Wisconsin ice sheet, contained many lakes and bogs, surrounded by spruce parkland or spruce forest (Connally and Sirkin 1970), a habitat which was evidently very attractive to the American mastodon (Mastodon americanus). The county has yielded more specimens of this species than any other part of the state, and most of these have been found

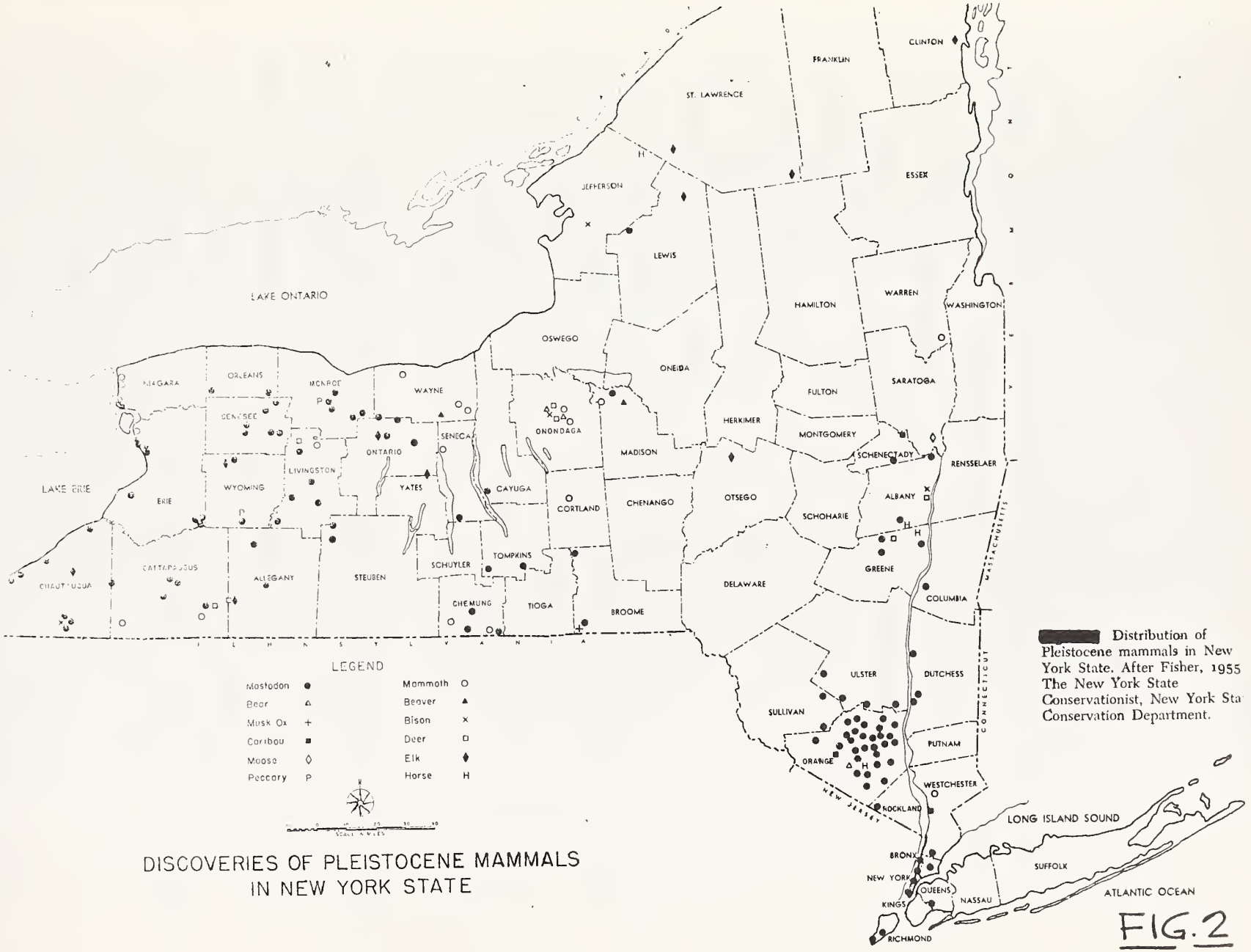
Note: Figure 1 was a copy of the project map. See Appendix A for this figure.

in bog deposits similar to those at Chester. A 1921 survey listed 31 specimens from Orange County (Hartnagel and Bishop 1921:42-52). Since that time, many additional specimens have been recovered (see for example Hay 1923; Fisher 1955; Fisher and Reilly 1969; Dumont and Ehlers 1973). Other extinct fauna have also come from these muck deposits, including a specimen of the moose-elk (Cervalces scotti) which yielded a radiocarbon date of 10,950 B.P. (Funk,Fisher,and Reilly 1970).

Two mastodon recoveries are particularly pertinent to the present survey.

One specimen, discovered in 1807 or 1808 and excavated in 1817, came from the Yelverton farm in the Otter Creek drainage near the Chester-Goshen town line, less than 1½ miles from the Cromline Creek project area. A large portion of the skeleton, including both upper and lower jaws with teeth and tusks, was recovered "from a layer of peat and were nowhere in contact with the marl that underlaid this formation at a depth of about 6 feet. Beneath and immediately around the bones was a mass of coarse vegetable fibers said to resemble chopped straw—perhaps the remains of the last meal" (Hartnagel and Bishop 1921:45-46).

Another specimen was recently discovered during ditching operations in a muck field at Sugar Loaf, about 3½ miles south of the project site, and was removed by members of the Orange County Chapter of the New York State Archeological Association (Dumont and Ehlers 1973). A radiocarbon date of 9,860 B.P. on a bone fragment from this mastodon is in general agreement with other mastodon dates from this part of the




DISCOVERIES OF PLEISTOCENE MAMMALS IN NEW YORK STATE

Distribution of Pleistocene mammals in New York State. After Fisher, 1955 The New York State Conservationist, New York Sta Conservation Department.

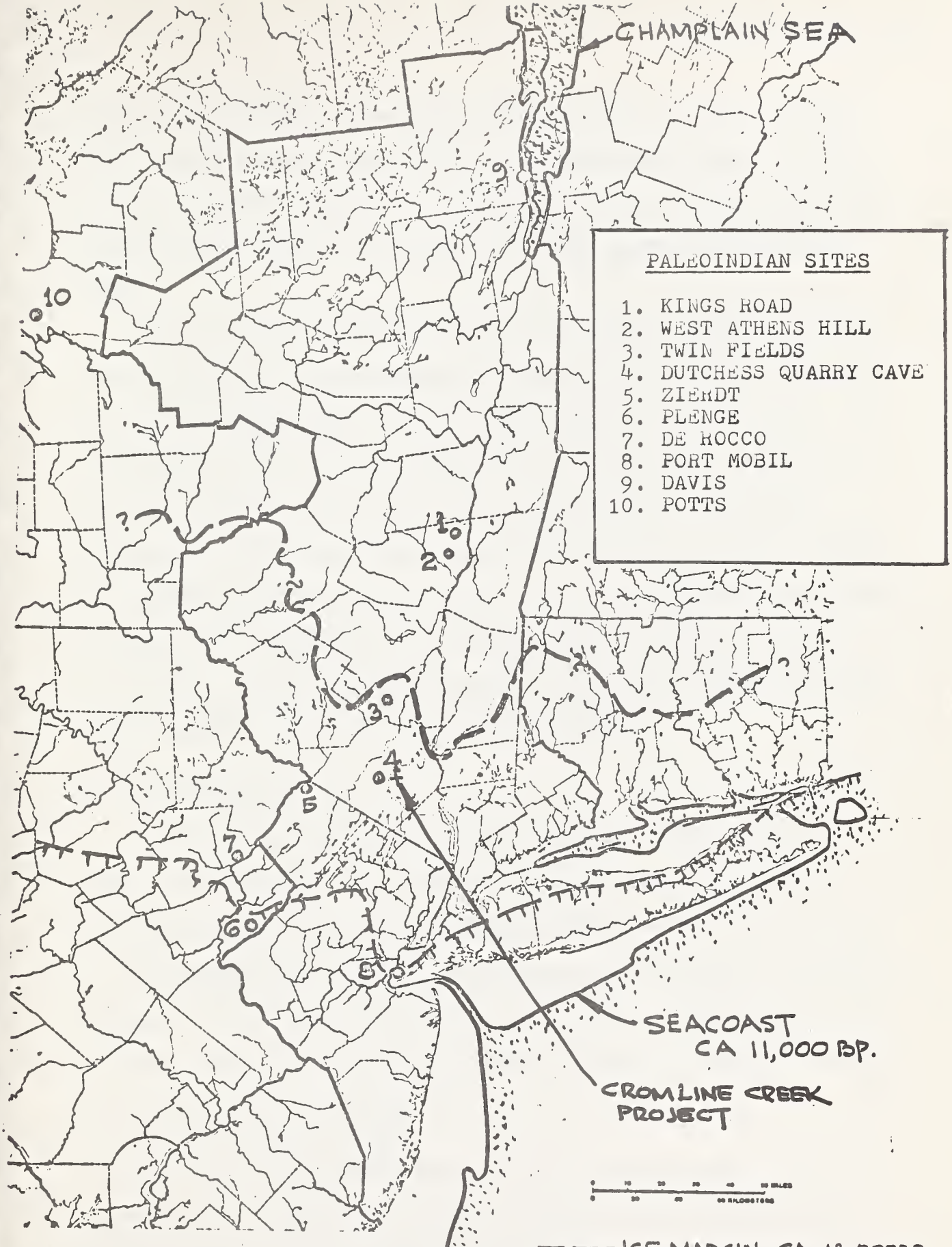
FIG. 2

northeast.

Because of the frequency with which specimens of extinct megafauna have been recovered from similar terrain in the immediate vicinity of the village of Chester, it would seem quite possible that additional specimens may be encountered during the widening and rerouting of the Cromline Creek ditches.

None of the organizations maintaining state-wide site inventories (the New York State Museum, New York State Division of Historic Preservation, New York Archaeological Council) have records of archaeological or historic sites within the boundaries of the Cromline Creek project area, and the boggy terrain that occupied the area before the establishment of the modern truck farms would not have been particularly suitable for prehistoric habitation sites. Nevertheless, there is distinct possibility that evidence for a particular kind of prehistoric human activity may be encountered during construction.

Orange County, New York, and the adjacent parts of northeastern Pennsylvania and northwestern New Jersey--the region that has produced many mastodon specimens--is also the locus of archaeological finds relating to the Paleoindians, the earliest human occupants of the northeast. Three Paleoindian habitation sites are known from the Delaware valley between the Water Gap and Port Jervis, New York (Kraft 1973; Werner 1964; McNett n.d.). One of these, on the Pennsylvania side, has yielded a radiocarbon date of 10,590 B.P. (McNett, personal communication). In Orange County itself, Dutchess Quarry




LOCATIONS OF PALEOINDIAN SITES IN RELATION TO THE CROMLINE CREEK PROJECT

FIG. 3

cave, near Florida, about 5½ miles southwest of the Cromline Creek project area, has yielded a fluted Paleoindian projectile point, and a fragment of caribou bone in presumed association has been dated at 12,530 B.P. (Funk,Fisher, and Reilly 1970).

Thus, there is evidence that the earliest human occupants of this area were contemporaneous with the mastodons and other Pleistocene megafauna, and may have hunted them for food. A Paleoindian "kill site," marked by the butchered skeleton of the prey and the tools used in the killing and butchering activities, has never been recognized in eastern North America. The possibility that such a site will be encountered at Chester is admittedly slight, but, because such a discovery would be of enormous scientific importance, this factor should receive consideration during the ditching operation.

II. Interviews.

Officers of the Orange County Chapter of the New York State Archeological Association, who have had many years of familiarity with the archaeological resources of their sector of southeastern New York, did not have any knowledge of archaeological discoveries within the project area. Farmers who work the area were also questioned, with similarly negative results.

III. Field Reconnaissance.

Two field trips were made to the project area. On the second visit, the writer and his assistant were accompanied by six members of the Orange County Chapter (John Dumont,

Lewis Dumont, William Ehlers, Kenneth Greene, Helen Tolosky, and William Sternitzke). No test excavations were conducted, partly because many of the fields adjacent to the drainage ditches were already planted in onions, but mainly because preliminary reconnaissance had indicated that this form of exploration would not be necessary; an adequate assessment of subsurface conditions could be made through examination of the sides of the many ditches. During the survey, both walls of all ditches in the project area were examined, as was the surface for a distance of about 10 to 20 feet on each side of each ditch.

No prehistoric cultural material or evidence of extinct megafauna was encountered during the field reconnaissance. Indications of post-contact occupation--ceramic sherds, glass fragments, scraps of metal--were quite frequent, but completely out of context, probably deposited on the fields together with manure and kitchen garbage during the years of agricultural use.

IV. Conclusions and Recommendations.

A thorough bibliographic search, followed by an equally thorough field reconnaissance, has failed to reveal any evidence of paleontological, archaeological, or historic resources that would suffer negative impact from the proposed Cromline Creek flood control project.

Nevertheless, for the reasons noted in Section I of this report, it is quite possible that specimens of Pleistocene megafauna, or, less likely, Paleoindian cultural materials,

may be encountered during the ditching operation. Because such finds would be extremely important to both archaeology and paleontology, it is recommended that steps be taken to insure that chance discoveries, if they should occur, will be recognized and properly excavated and recorded. Ideally, an archaeologist should be present throughout the heavy ditching phase of construction. At very least, an archaeologist should examine the newly exposed ditch walls and the excavated fill at frequent intervals during this phase of the work, and should be called to the site immediately if large bone fragments or possible signs of prehistoric activities are encountered.

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